SIEMENS

Building Technologies

SINAMICS G120P VSD

Getting Started Guide
For the HVAC Industry

Basic Operator Panel Edition **11/2011**

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1 Safety

Before installing and putting the equipment into operation, read these safety instructions and warnings carefully.
Also read and obey all warning signs attached to the equipment. Make sure that the warning labels are kept in a legible condition and replace any missing or damaged labels.

Warning

- This equipment contains dangerous voltages and controls dangerous rotating mechanical parts. Loss of life, severe personal injury or property damage can result if the instructions contained in this Manual are not followed
- Only suitably qualified personnel should work on this equipment, and only after being familiar with all safety notices, installation, operation and maintenance procedures contained in this Manual
- Use only permanently wired input power connections. The equipment must be grounded (IEC 536 Class 1, NEC, and other applicable standards)
- If a Residual Current Circuit Breaker (RCCB or ELCB) is required, type B with a 300 mA tripping current must be used (the RCCB. should only supply one VSD). An unfiltered VSD should be used or if the VSD has an EMC filter this must be disconnected, due to the filter leaking current to earth. The neutral conductor in the system must be grounded
- Wait at least 5 minutes after the power has been turned off, before opening the equipment. The dc-link capacitor remains charged to dangerous voltages even when the power is removed. When working on open equipment, note that live parts are exposed and do not touch such parts
- Do not connect machines with a 3-phase power supply, fitted with EMC filters, to a supply via an ELCB (Earth Leakage Circuit Breaker - see EN 50 178, section 6.5)
- Note that certain parameter settings may cause the VSD to restart automatically after an input power failure
- Do not use this equipment as an “emergency stop” mechanism (see EN 60 204, 9.2.5.4)
- Note that certain parameter settings may cause the VSD to start automatically
- Obey all general and regional installation and safety regulations relating to work on low-voltage installations, as well as regulations covering correct use of tools and personal protective equipment
- This equipment is capable of providing internal motor overload protection in accordance with UL508C section 42. An external PTC can also provide motor overload protection via a special input
- This equipment is suitable for use in a circuit capable of delivering not more than 100,000 symmetrical amps (rms) for a maximum voltage of AC 460 V when protected by a time delay fuse.
- Do not use the unit with a motor of a higher nominal power rating than the VSD, or a nominal power less than half that of the VSD. Only operate the VSD when the nominal current in P0305 exactly matches the motor rating plate nominal current
- When using the analog inputs, the DIP switches must be correctly set and the analog inputs correctly configured before enabling them. If this is not done, the motor may start inadvertently

Caution

- Do not allow children or the general public to access or approach this equipment
- Do not install the VSD where it will be subjected to shock, vibration, electromagnetic radiation, water hazards, or atmospheric pollutants such as dust or corrosive gasses
- Keep Operating Instructions, etc., with this equipment or with the end-user
- Use this equipment only for the purpose specified by the manufacturer. Do not carry out any modifications or fit any spare parts, which are not sold or recommended by the manufacturer; as this could cause fire, electric shock or other injuries.

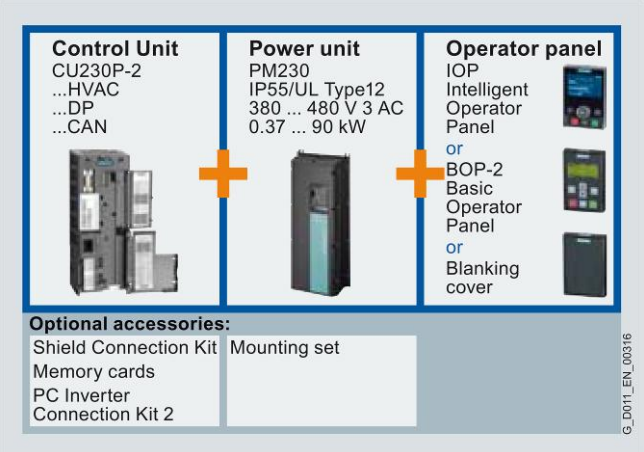
2 Introduction

The G120P variable speed drive is aimed at providing a versatile solution for various industrial and commercial applications, and so there are a number of options that can be chosen to suit.

2.1 *Components of the G120P*

The complete G120P unit is comprised of three parts, namely the Control Unit, Power Module, and an Operator Panel.

For the HVAC industry the options recommended are the CU230P-2 HVAC Control unit, The PM230 IP55 Power module, and a choice of either Basic/Intelligent Operator panels, or even a blanking cover.



2.1.1 Intelligent Operator Panel IOP

The IOP supports both entry-level personnel and drive experts. Thanks to the large plain text display, the menu prompting and the Application Wizards, it is easy to commission, diagnose and locally control standard drives. Users are guided interactively through the commissioning process by the integrated Application Wizards.

2.1.2 Basic Operator Panel BOP-2

Menu prompting and the 2-line display support fast and user-friendly commissioning of the inverter. Simultaneous display of the parameter and parameter value, as well as parameter filtering, means that basic commissioning of a drive can also be performed without a printed parameter list.

Control Unit **Basic Operator Panel - 2** **Intelligent Operator Panel**

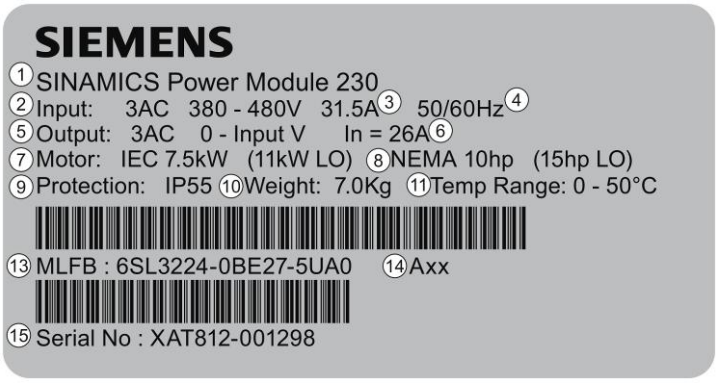
2.1.3 Power Modules – PM230 IP55

2.2 *Rating label information*

Every Power Module has a rating label which details the specifications of the Power Module.

The specifications shown on the rating label can vary due to the requirements of specific regulations and compliance standards imposed by the country of origin and the final destination of the product.

Detailed below is an explanation of all the information that might appear on a typical rating label of a Power Module.


SIEMENS
1 SINAMICS Power Module 230
2 Input: 3AC 380 - 480V 31.5A 3 50/60Hz 4
5 Output: 3AC 0 - Input V In = 26A 6
7 Motor: IEC 7.5kW (11kW LO) 8 NEMA 10hp (15hp LO)
9 Protection: IP55 10 Weight: 7.0Kg 11 Temp Range: 0 - 50°C
13 MLFB : 6SL3224-0BE27-5UA0 14 Axx
15 Serial No : XAT812-001298

Item	Description	Notes
①	Product name	
②	Input voltage range	
③	Rated input current	
④	Nominal input frequency	
⑤	Output voltage range	This is determined by the range of the input voltage range.
⑥	Nominal current	
⑦	European motor rating	
⑧	North America motor rating	
⑨	Protection rating	The IP rating denotes the protection the product has against environmental conditions.
⑩	Weight	It is the weight of the product only.

⑪	Temperature range	Is the operating temperature range of the product.
⑫	The country of origin and manufacture	
⑬	Order number	
⑭	Hardware version	
⑮	Serial number	

2.3 *Website link to G120P Manuals*

Included is the G120P website link where you can download all of the latest manuals and information. Also listed are the document ID numbers to make searching easier (The first two are currently supplied in the boxes).

http://www.automation.siemens.com/mcms/standard-drives/en/low-voltage-inverter/sinamics-g120p/Pages/sinamics-g120p.aspx

CU230P-2 HVAC - Getting Started Guide	A5E02792536C AB
G120P Power Module - Getting Started Guide	A5E02923634A
CU230P-2 HVAC - Control Unit Operating Manual	A5E02430659B AD
CU230P-2 HVAC - Control Unit Parameter Manual	A5E02297932B AD
PM230 IP55 - Power Module Hardware Installation	A5E02923635A AB
BOP2 Manual	A5E02778927A AB
IOP Manual	A5E00110011A AB

3 Planning

The G120P was designed to be flexible and adaptable to suit the needs of the HVAC environment. There are a number of features that help achieve this and should be considered before installation: -

1. The VSD output characteristic can be changed to suit the load type – including energy optimization and Sensor-less Vector Control. See next page for more information.
2. The VSD overload specification can be selected (LO/HI) to match the dynamic needs of the load. For more current (and therefore torque) capability, use the High Overload option – which uses the next size up in power module. See next point, and next page for more information.
3. The standard operating temperature range can be extended (50C with no derating) to suit the intended install location by using the HI Overload option.
4. There are a number of Human Machine Interface options: -
    a. Blanking plate (usually for use with High Level Interface, or to prevent tampering).
    b. Basic Operator Panel - helps on cost critical projects.
    c. Intelligent Operator Panel - an intuitive interface option. A very useful tool when combined with the remote handheld kit for commissioning technicians.
    d. Remote control and/or monitoring via the BACnet and Modbus (RS485) protocols that are included as standard.
5. Can be programmed with: -
    a. BOP – from application sheet or a program memory (i.e. cloned).
    b. IOP – from Wizards, Menu, or sixteen program memories (i.e. cloned).
    c. Laptop via USB cable (supplied with Power Module) and freely downloadable ‘Starter’ software from Siemens website.
    d. SD Card slot – allows up to 100 programs to be stored and cloned (e.g. project back-up).
6. Optional signals cable shield plate – provides a handy fastening and earth bonding point when using Nylon type cable glands on the shielded signal & communication cables.
7. Free Function Blocks (including 7 day time-switch, logic blocks, and additional PID loops) allow for flexibility and new application opportunities.
8. HVAC relevant, built-in features like Hibernation, Essential Services Mode, Multi-zone signal processing, Auto-reset, Flying restart, V-belt failure detection, to name a few.

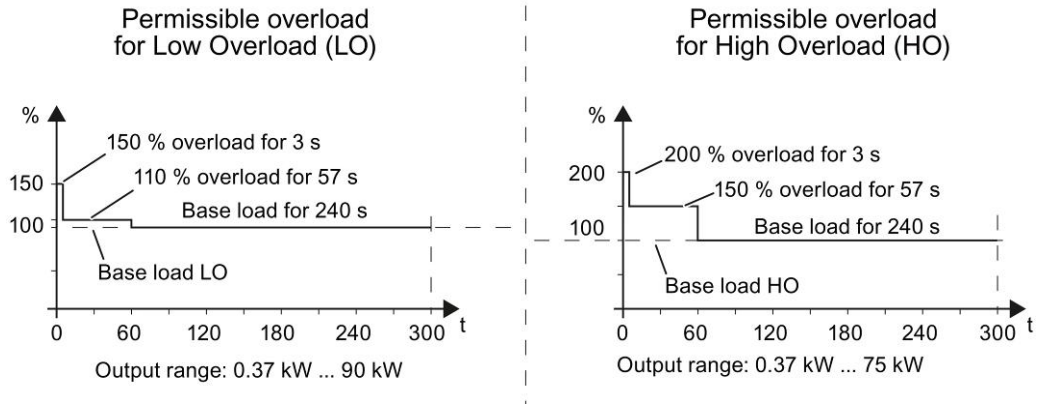
Point 1 – VSD Output Characteristic

The load characteristic parameter is found in P1300, and is part of the Setup Menu in the BOP2. The majority of HVAC loads are fans and pumps – both of which normally have a non-linear load characteristic that is often referred to as the fan curve, or pump curve. This means that at low speeds there is very little torque required, while at the high end of the speed range the demand is far greater. In this case you would select the Quadratic (also known as Parabolic) option P1300 = 2.

Other loads such as screw compressors have a linear characteristic that need more starting current to 'get away', and so the default setting of P1300=0 would be the best option.

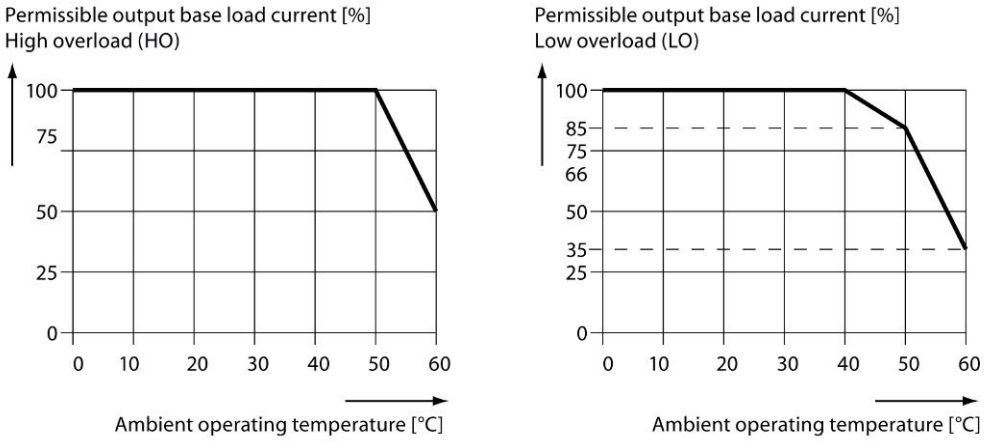
Point 2 – VSD Overload Specification

It is in these higher demand loads that the High Overload feature becomes a useful option to consider. To quickly accelerate a heavy centrifugal fan (i.e. high inertia), or for starting a compressor, there is a requirement for more torque which means more amps. By selecting the high overload option in P205, the permissible current overload levels are raised and the duration extended. Note that this extra current capability does not come for free, and in fact the next size up in power module has to be used.



Point 3 – Extending the Operating Temperature Range (at full load)

An added benefit of the High Overload feature is the extension of the operating temperature range from 40°C to 50°C without any current de-rating. It is only between 50°C to 60°C that a current de-rating still applies. See the charts below for details.



Note that the base load current [%] refers to the continuous rated output current for the particular power module selected.

As can be seen, this flexibility allows you to tailor the drive to suit the dynamic characteristic of the load and the ambient conditions of the installation, so you only have to pay for what you need, rather than a one size fits all approach.

3.1 *Sizing*

When sizing drives there is a common misconception that matching the kilowatts of the motor to the drive is the correct method, and while most of the time it will be satisfactory, there are occasions when there will be a shortfall in current capability due to installation-based derating factors, and special load requirements. For example, do you need more than the rated **F**ull **L**oad **A**mps to start the motor? (e.g. certain types of pumps and compressors).

To ensure the power module is the correct one before bolting it on the wall, you can use the following chart to check suitability. Just read the actual **FLA** from the motor nameplate (that matches the connection type, supply voltage, and Hz), and see which power module matches or exceeds the desired value in the relevant temperature column. Note that the **kW** and Typical **FLA** values shown in the first, second, and sixth columns are provided for comparative information only.

G120P Selection Table									
Typical 4-pole	**Low OL Mode (Default)**				**High OL mode**				
Motor FLA	**kW**	**A 40C**	**A 50C**	**A 60C**	**kW**	**A 50C**	**A 60C**	**Frame**	**Power Module with Class B**
1.0	0.37	1.3	1.1	0.5	0.25	0.9	0.45	FSA	6SL3223-0DE13-7BA0
1.4	0.55	1.7	1.4	0.6	0.37	1.3	0.65	FSA	6SL3223-0DE15-5BA0
1.9	0.75	2.2	1.9	0.8	0.55	1.7	0.85	FSA	6SL3223-0DE17-5BA0
2.5	1.1	3.1	2.6	1.1	0.75	2.2	1.1	FSA	6SL3223-0DE21-1BA0
3.3	1.5	4.1	3.5	1.4	1.1	3.1	1.55	FSA	6SL3223-0DE21-5BA0
4.5	2.2	5.9	5.0	2.1	1.5	4.1	2.05	FSA	6SL3223-0DE22-2BA0
5.9	3	7.7	6.5	2.7	2.2	5.9	2.95	FSA	6SL3223-0DE23-0BA0
7.9	4	10.2	8.7	3.6	3	7.7	3.85	FSB	6SL3223-0DE24-0BA0
10.1	5.5	13.2	11.2	4.6	4	10.2	5.1	FSB	6SL3223-0DE25-5BA0
13.6	7.5	18	15.3	6.3	5.5	13.2	6.6	FSB	6SL3223-0DE27-5BA0
20.2	11	26	22.1	9.1	7.5	18	9	FSC	6SL3223-0DE31-1BA0
27.4	15	32	27.2	11.2	11	26	13	FSC	6SL3223-0DE31-5BA0
31.9	18.5	38	32.3	13.3	15	32	16	FSC	* 6SL3223-0DE31-8AA0 *
38.0	22	45	38.3	15.8	18.5	38	19	FSD	6SL3223-0DE32-2BA0
51.8	30	60	51.0	21.0	22	45	22.5	FSD	6SL3223-0DE33-0BA0
63.8	37	75	63.8	26.3	30	60	30	FSE	6SL3223-0DE33-7BA0
75.3	45	90	76.5	31.5	37	75	37.5	FSE	6SL3223-0DE34-5BA0
91.5	55	110	93.5	38.5	45	90	45	FSF	6SL3223-0DE35-5BA0
122.0	75	145	123.3	50.8	55	110	55	FSF	6SL3223-0DE37-5BA0
151.4	90	178	151.3	62.3	75	145	72.5	FSF	6SL3223-0DE38-8BA0
Size PM by the maximum motor current and the desired operating temperature. Sometimes the required current rating can be 3 x FLA.									
* 18.5 kW PM is currently only available with an integral class A EMC filter. Ensure you select the appropriate unit for your installation									

3.2 *EMC Considerations*

In 2005 the standards governing the level of acceptable noise emission and immunity (or Electro Magnetic Compatibility AS/NZS 61800.3) were redefined to ensure that the appropriate level of filtering and installation methods were used to suit the differing environments that the equipment operated in.

This meant that for industrial areas where the chance of causing disruption to third parties was minimal, the level of electromagnetic noise allowed to be emitted was greater than for commercial areas where there might be consumer or medical devices. So the costs of additional filtering and installation methods would only be incurred when necessary, rather than a one size fits all approach.

These areas are called the First Environment, and Second Environment. For the HVAC Industry the First Environment is the most common situation, and is defined below. Note that there are sub-categories that further define the EMC requirements.

First Environment (also known as Domestic)
An environment that includes domestic premises and establishments that are connected directly to a public low-voltage power supply network (i.e. 240/415V) without the use of an intermediate transformer (11kV/415V). For example: houses, apartments, commercial premises or offices in a residential building.

Second Environment (Typically Industrial)
All other environments not falling under the First Environment definition. For example a factory supplied by a dedicated transformer that does not also feed domestic or residential buildings.

3.2.1 Category C1 (First Envir.)

Power Drive System (PDS, **i.e. VSD + Motor + Sensors**) of rated voltage less than 1000 V intended for use in the First Environment. **This means any equipment that can be connected to a supply shared by residencies, and is a 'catch-all' that includes portable equipment. This would require Class B EMC filters.**

3.2.2 Category C2 (First Envir.)

Power Drive System (PDS) of rated voltage less than 1000 V, which is neither a plug in device nor a movable device, and when used in the First Environment, is only intended to be installed and commissioned by a professional. **This is for fixed plant and equipment, and is where the majority of G120P would be installed. Class A EMC filters would be the first choice, but may need to upgrade to Class B.**

Note: A professional is a person or an organization having necessary skills in installing and/or commissioning a Power Drive System (PDS), including their EMC aspects. **This means an electrician with the relevant competency.**

3.2.3 Category C3 (Second Envir.)

Power Drive System rated less than 1000V intended for use in the Second Environment, and not intended for the First Environment. I**ndustrial rated equipment installed in a building with its own transformer.**

G120P Motor Cabling Requirements
The following cabling requirements should be adopted to meet the Category specifications – as indicated in the table below.

PM230	Cable type	EMC category	Max. cable length
EMC Filter Class B (standard offering)	Screened	C1 (conducted only)	25 m* (with blue ring)
	Screened	C2	50 m (no blue ring)
	Unscreened	None (Special Cases Only)	100 m
* Power Modules with Class B integrated filters, frame sizes A to C, must be fitted with a blue ferrite ring on the motor cable between the Power Module power terminals and the screening plate of the Power Module to fulfil EMI category C1 conditions. Power Modules with Class B integrated filters, frame sizes B and C must be fitted with a grey ferrite ring/s on the mains supply input cable in addition to the ferrite ring on the motor cable.			

4 Installation

4.1 *Dimensions*

G120P		Dimensions (mm)			Clearance Distance			Mounting Holes		Bolts
Frame	kW (LO)	Width (X)	Height (Y)	Depth (Z)	Above	Below	Side	Width (X)	Height (Y)	mm
FSA	0.37…3.0	154	460	264	100	100	0	132	445	4
FSB	4.0…7.5	180	540	264	100	100	0	158	524	4
FSC	11…15	230	620	264	125	125	0	208	604	5
FSD	22…30	320	640	344	300	300	50	285	600	8
FSE	37…45	320	751	344	300	300	50	285	710	8
FSF	55…90	410	915	431	350	350	50	370	870	8

4.2 *Connections*

⚠ **WARNING**

Power and motor connections
A fixed location, non varying connection is necessary because of a leakage current
> 3.5 mA.

The inverter must always be grounded. If it is not grounded correctly, extremely dangerous conditions may arise which could prove potentially fatal.

Isolate the mains electrical supply before making or changing connections to the unit.

The terminals of the Inverter can carry dangerous voltages even if the inverter is inoperative. Wait at least 5 minutes to allow the unit to discharge after switching off the power supply before carrying out any installation work.

When connecting the power supply to the inverter, make sure that the terminal case of the motor is closed.

When changing from the ON to OFF-state of an operation if an LED or other similar display is not lit or active; this does not indicate that the unit is switched-off or powered-down.

Ensure that the inverter is configured for the correct supply voltage – it must not be connected to a higher voltage supply.

⚠ **WARNING**

Filtered drives can only be used on power systems with grounded star-point.

⚠ **CAUTION**

Cable cross section for protective earthing (not earth bonding)

The material of the protective earthing conductor must be the same as the material of the power cable. If not, the specific resistance of the protective earthing conductor must not be higher than the specific resistance of the power cables. The relevant diameter of the power cables is the diameter of the line supply cables, not the diameter of the motor cables.

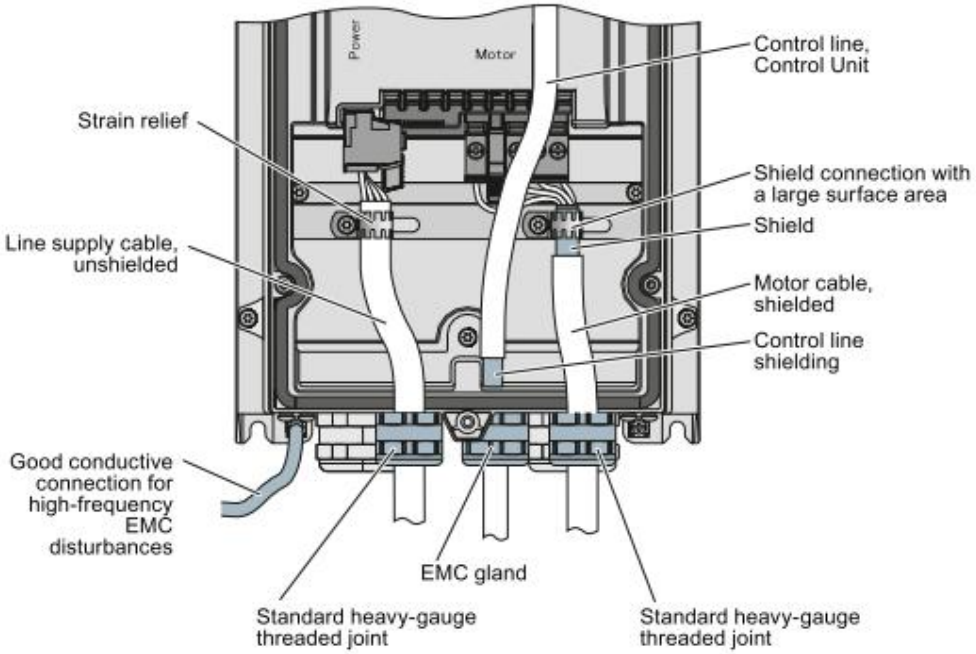
For power cables up to 10 mm² the earth cable must be at least as big as the power cables.

For power cables larger than 10 mm² the earth cable must be at least 10 mm², but need not exceed these sizes – except when the diameter is more than 35 mm², the protective earthing conductor must have at least half of the size of the cross section of the power cable.

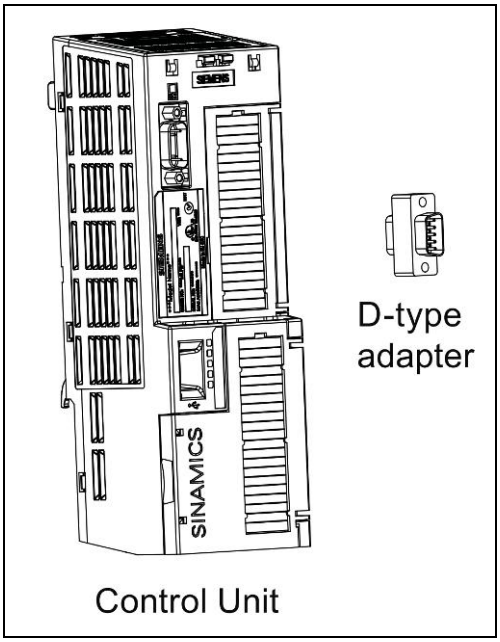
Refer to AS/NZS 3000 and AS/NZS 3008 for sizing and tables.

4.3 *EMC Compliant Install for IP55 Units*

The following diagram shows the EMC-compliant installation of Power Modules with degree of protection IP55 / UL type 12.



5 Assembly - Notes



Make sure the D-type adapter is not lost! You will need it to connect the operator panel to the control unit through the front lid on drive units 0.37kW to 15kW.

Using the optional shielding plate will depend on the installer's preference. You should consider the number of shielded signal cables - and therefore metal bonding glands required, compared to using nylon cable glands and the shielding plate. Note that some kind of cable gland will always be required or the IP55/4 rating will be lost. Corrugated conduit adapters are not suitable as they do not seal out the humidity.

5.1 *Fitting the D-type adapter retaining bracket*

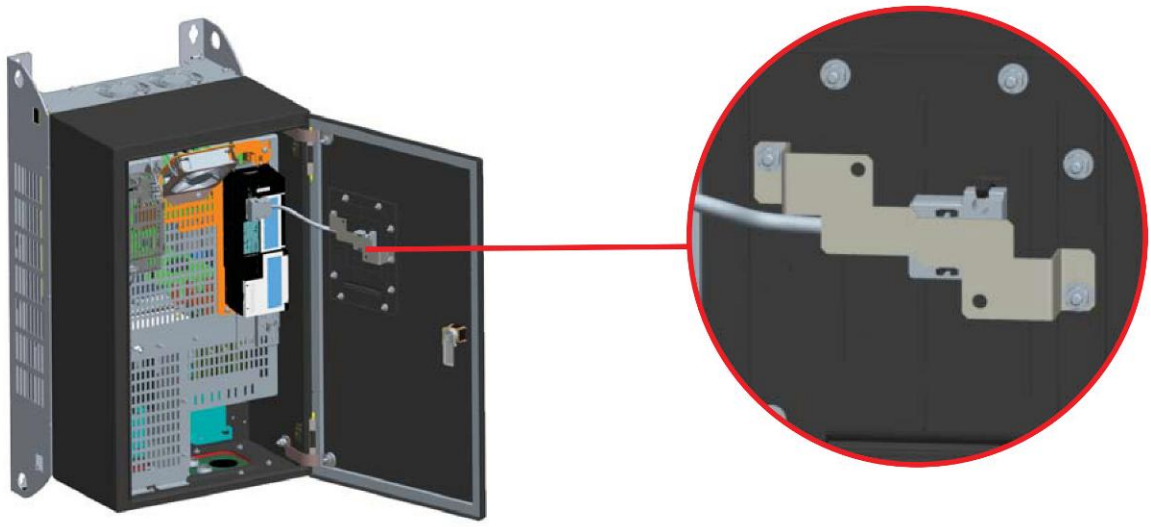


Figure 3-9 Adapter cable bracket FSD to FSF

A special bracket has been designed to ensure that the D-type adapter is fixed securely to the enclosure door. The bracket is fitted as shown in the figure below. The bracket and fixings are supplied with the product.

5.2 *Fitting ferrite rings to the motor and mains supply cables*

5.2.1 Motor cable blue ferrite ring

If you are installing the drive into a Category 1 (First Environment) then it is necessary to fit the blue ferrite ring to the motor cable on the PM230 frame sizes A to C (0.37 kW ... 15.0 kW)

The blue ferrite ring must be fitted between the motor power cable terminals and the screening plate of the power module.

In this case the maximum motor cable length is 25 m.

The ferrite rings required for PM230 FSA to FSC with integrated Class B filters are supplied with the product.

5.2.2 Mains supply cable ferrite rings

It is necessary to fit the gray ferrite rings to the mains supply cable of the PM230 frame size B (4.0 kW ... 7.5 kW) and frame size C (11.00 kW ... 15.0 kW) with an integrated B class filter to ensure it fulfils the EMI standard for radiated emissions.

The gray ferrite rings must be fitted between the terminals and the screening plate on the mains supply cable.

The ferrite rings required for PM230 FSB to FSC with integrated Class B filters are supplied with the product.

The correct fitting of the ferrite rings is shown in the figure below.

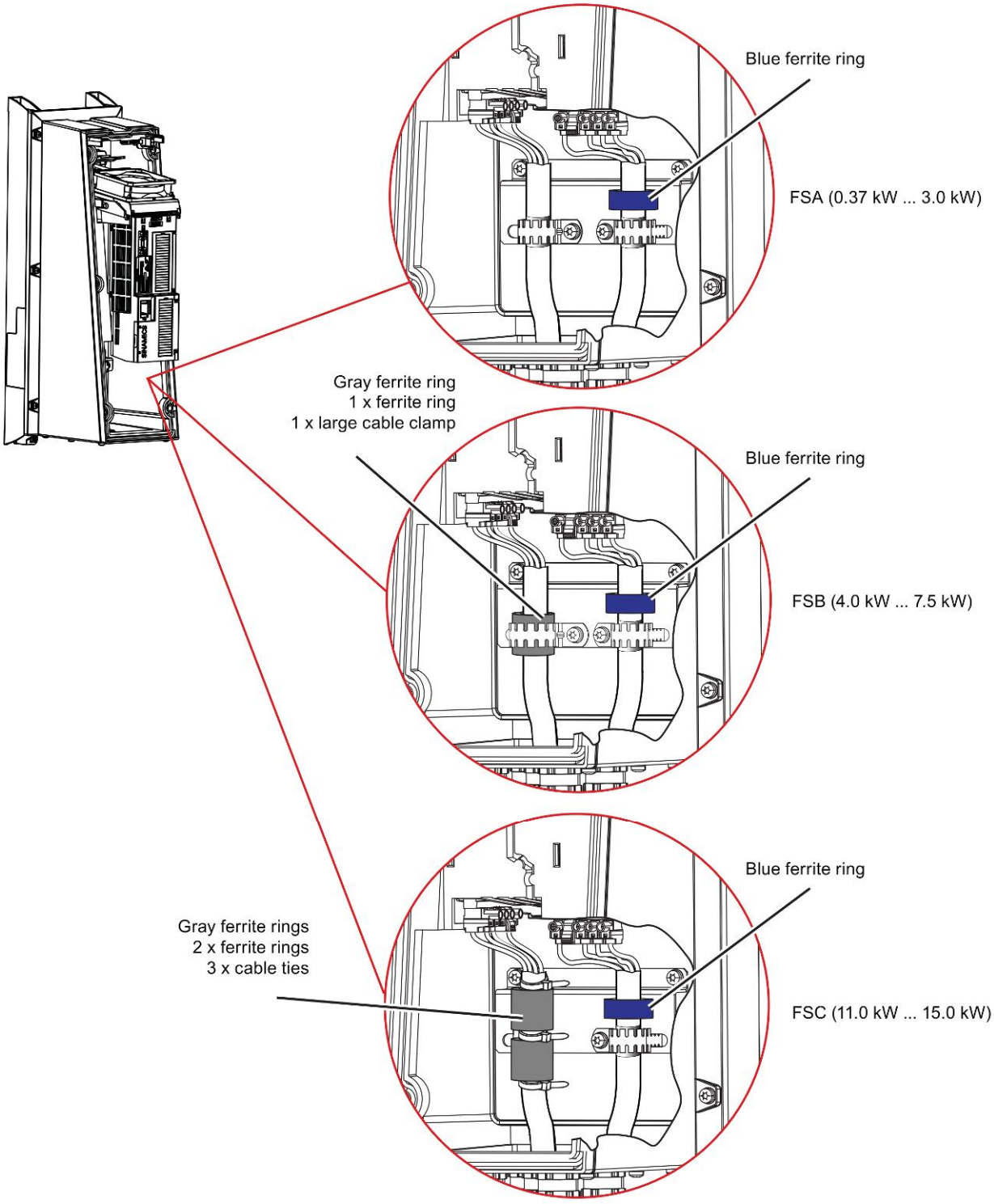
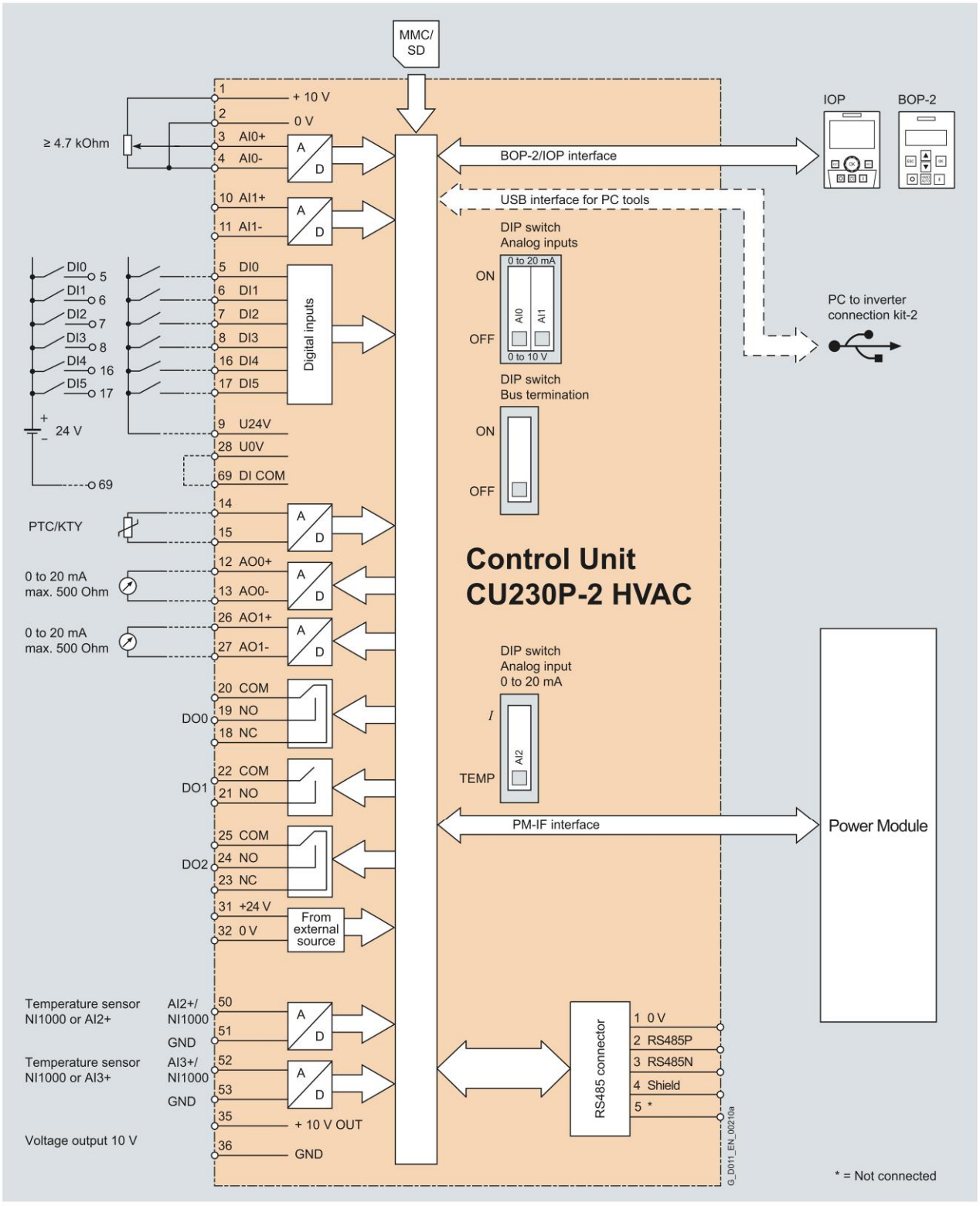

Blue ferrite ring
FSA (0.37 kW ... 3.0 kW)
Gray ferrite ring
1 x ferrite ring
1 x large cable clamp
Blue ferrite ring
FSB (4.0 kW ... 7.5 kW)
Blue ferrite ring
Gray ferrite rings
2 x ferrite rings
3 x cable ties
FSC (11.0 kW ... 15.0 kW)

Figure 4-11 Fitting ferrite rings to motor and mains supply cables

As previously noted, you only need to use the blue ferrite rings for EMC Category 1 installations, and doing so reduces the maximum motor cable length from 50 metres to 25 metres.

5.3 *Control Unit Connections*



CU230P-2 HVAC Control Unit connection diagram

Note that the ratings for the digital outputs are as follows:

DO-0 = 250Vac, 2A Relay output. By default this is set to **Fault** indication.
DO-1 = 30Vac, 0.5A Transistor (Triac) output. By default this is set to **Alarm** indication.
DO-2 = 250Vac, 2A Relay output. By default this is set to **Run** indication.
The default action of these outputs is to energize when showing the desired indication.
All of these default settings can be changed in the relevant parameters.

6 Commissioning

6.1 *Using the Basic Operator Panel*

6.1.1 Layout and functions

The physical layout of the BOP-2 is shown below:

Description of BOP-2 physical characteristics

Item	Description
①	Release catch
②	LCD screen
③	ESC key
④	Up key
⑤	Down key
⑥	OK key
⑦	OFF key
⑧	HAND/AUTO key
⑨	ON/Run key
⑩	Door mounting screw recess
⑪	RS232 connector
⑫	Product rating label

Key	Function
OK	The OK key has the following functions: • When navigating through the menus, pressing the OK key confirms selection of a menu item. • When working with parameters, pressing the OK key allows the parameter to be modified. Pressing the OK key again will confirm the entered value and return you to the previous screen. • In the faults screen it is used to clear faults.
▲	The UP key has the following functions: • When navigating a menu, it moves the selection up through the screens available. • When editing a parameter value it increases the displayed value. • If HAND mode is active and Jog is ON, a long press of the UP and DOWN key together has the following effects: – If reverse is ON, it switches the reverse function OFF. – If reverse is OFF, it switches the reverse function ON.
▼	The DOWN key has the following functions: • When navigating a menu, it moves the selection down through the screens available. • When editing a parameter value it decreases the displayed value.
ESC	The ESC key has the following functions: • If pressed for less than 2 seconds the BOP-2 returns to the previous screen or if a value has been edited, the new value is not saved. • If pressed longer than 3 seconds the BOP-2 returns to the status screen. When using the ESC key in the parameter editing mode, no data is saved unless the OK key is pressed first.
I	The ON key has the following functions: • In AUTO mode, the ON key is not active and if pressed it will be ignored. • In HAND mode the Inverter is started - the Inverter will display the drive running icon.
○	The OFF key has the following functions: • In AUTO mode press the OFF key will have no effect and the key press will be ignored. • If pressed for longer than 2 seconds the Inverter will perform an OFF2; the motor will then coast down to a standstill. • If pressed for less than 3 seconds the following actions will be performed: – If the OFF key is press twice in less than 2 seconds on OFF2 will be performed. – If in HAND mode the Inverter will perform an OFF1; the motor will come to a standstill in the ramp-down time set in parameter P1121.
HAND AUTO	The HAND/AUTO key switches the command source between the BOP (HAND) and fieldbus (AUTO). • If HAND mode is active, pressing the HAND/AUTO key will switch the Inverter to AUTO mode and disable the ON and OFF keys. • If AUTO mode is active, pressing the HAND/AUTO key will switch the Inverter to HAND mode and enable the ON and OFF keys. Changing between HAND mode and AUTO mode is possible while the motor is still running.

Note: Reaction to change between HAND and AUTO mode

When changing from HAND to AUTO mode the Inverter will react in the following way:

- If the ON signal is active the new setpoint will become active and the Inverter will automatically ramp the motor to the new setpoint after the change of mode.

When changing from AUTO to HAND mode the Inverter will react in the following way:

- The Inverter will not stop the motor running. The Inverter will run the motor at the same speed that was set prior to the HAND AUTO key being pressed. Any ramp function that was in progress will be stopped.

Locking and unlocking the keypad

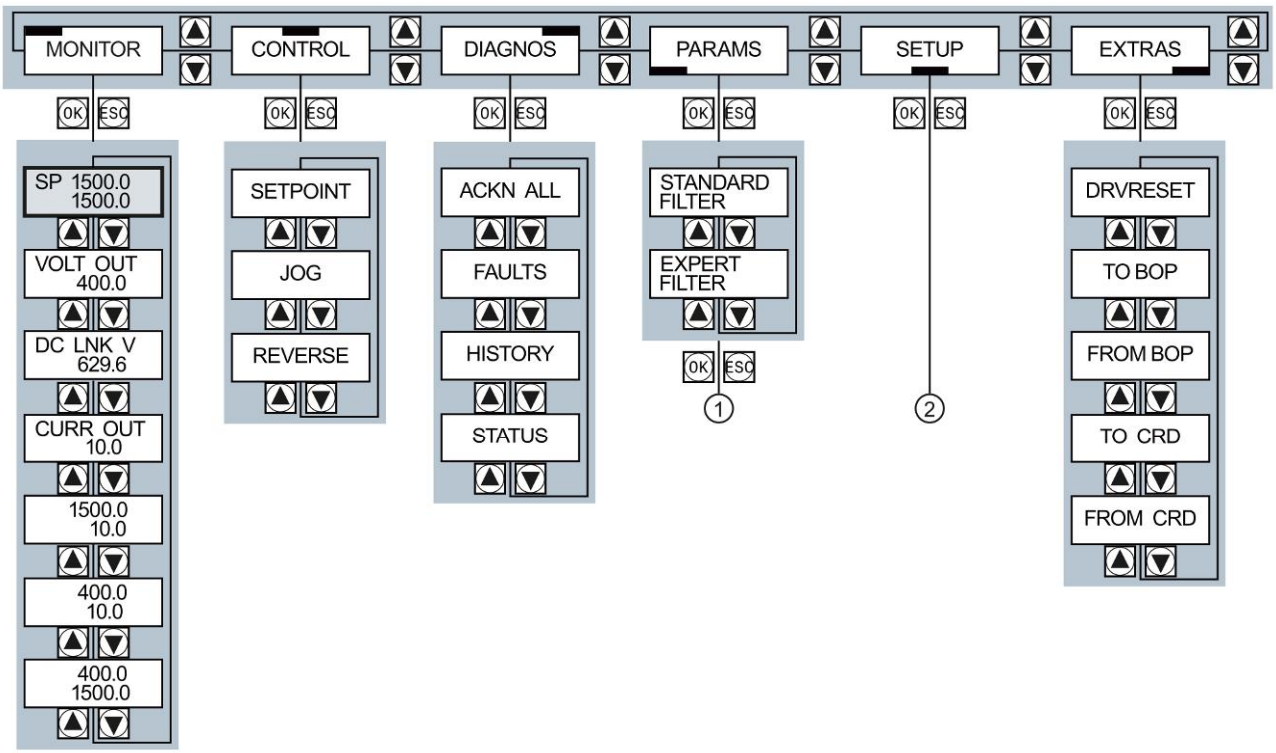
To lock the BOP-2 keypad press ESC and OK simultaneously for 3 seconds or more. To unlock the keypad press ESC and OK simultaneously for 3 seconds or more.

Screen icons

The BOP-2 displays a number of icons at the left-hand side of the display to indicate the actual state of the Inverter. These icons are explained in the table below.

Function	Status	Icon	Remarks
Command source	Hand		When the HAND mode is active the icon is displayed. When AUTO mode is active, no icon is displayed.
Inverter status	Inverter and motor running		This is a static icon and does not rotate.
Jog	Jog function is active	JOG	
Fault/alarm	Fault or alarm pending Flashing symbol = Fault Steady symbol = Warning		If a fault is detected, the Inverter will be stopped and the user is required to take the necessary corrective actions to clear the fault. An alarm is a condition that will not stop the Inverter, for example, over temperature.

6.1.2 Menu structure



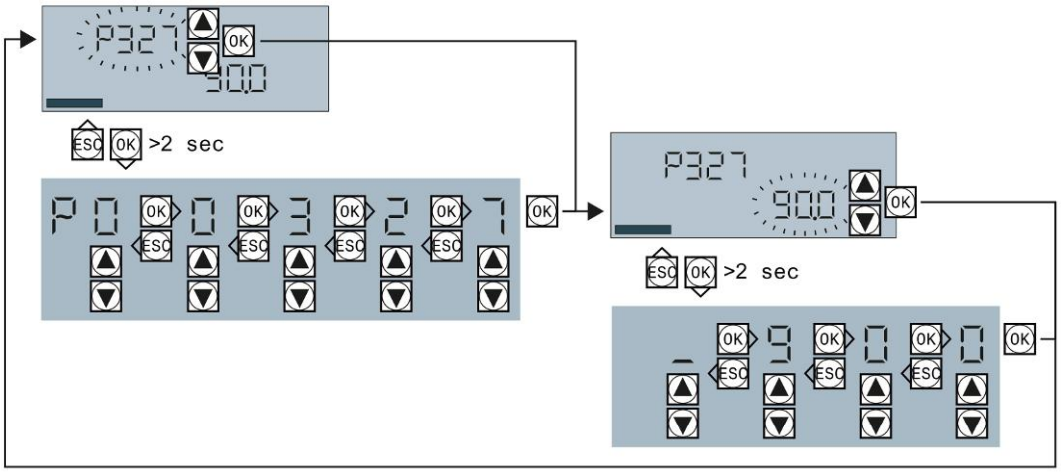
Changing parameter values:

① Parameter number freely selectable

② Basic commissioning

6.1.3 Freely selecting and changing parameters

Use BOP-2 to change your inverter settings, by selecting the appropriate parameter number and changing the parameter value. Parameter values can be changed in the "PARAMS" menu and the "SETUP" menu.



Select the parameter number		Changing a parameter value	
If the parameter number flashes in the display, you have two options for changing the number:		If the parameter value flashes in the display, you have two options of changing the value:	
1. option:	2. option:	1. option:	2. option:
Increase or decrease the parameter number using the arrow keys until the number you want is displayed.	Press and hold the OK key for more than two seconds and change the required parameter number digit by digit.	Increase or decrease the parameter value using the arrow keys until the value you want is displayed.	Press and hold the OK key for more than two seconds and enter the required value digit by digit.
Confirm the parameter number using the OK key.		Confirm the parameter value using the OK key.	

The inverter immediately saves all changes which you made using the BOP-2 so that they are protected against power failure.

6.2 *Commissioning the Drive*

6.2.1 Commissioning Steps

Here is a suggested commissioning process that shows the various stages of setting up a drive after you have planned the job and installed the device.

1. Note down the motor nameplate data. It is important that the values entered are correct, or the drive may not perform optimally. This is shown in section **5.2.3 Motor Nameplate Data**
    - Voltage (Volts)
    - Current (Amps)
    - Power (kW)
    - Speed (RPM)
2. After connecting the drive and ensuring it is safe, switch on and wait for the Basic Operator Panel (BOP) to initialize (under a minute).
3. If you chose to use the HI Overload feature (section **2 Planning**), then you need to complete the following:
    - In the Parameters area and set P10 = 1
    - set P205 = 0
    - go back to P10 = 0
    - There may be a short delay while the drive recalibrates the effected internal values.
4. Go to the Setup menu and complete the process detailed in section **5.2.4 Setup Menu**
    - Set the Minimum motor speed to protect it from stalling and overheating. E.g. 450 rpm for a 4 pole motor = 15Hz.
    - Enter Ramp up time = 30 seconds as a starting point. For large inertia loads (e.g. large diameter centrifugal fans) you may need to slow down the ramp up time to prevent over-current faults due to the mass x acceleration rule. If you need a fast start, you may need to install a larger unit – see the HI Overload option on page 7.
    - Skip Ramp-down time option (30 seconds is Ok as a starting point). Again, for large inertia loads, or if there is another fan acting on the same airflow (e.g. AHUs with a return air fan and a supply air fan), you may need to slow down the ramp down time to prevent overvoltage faults due to regeneration.
    - Note: A warning (A7991) will occur just to let you know the Motor ID option is selected.
    - If a fault (Fxxxx) is triggered during this process, proceed to the Diagnostics Menu and check on the correct course of action. This is shown in section **6 Troubleshooting**. In most cases you just have to acknowledge the fault, although in some instance you may need to cycle the power to clear the fault (Turn mains isolator off for >10 seconds, then On).
5. To start the Motor ID test (that you selected in the Setup Menu), select Hand and then Start (Green button). Drive should start a motor testing procedure that will last under a minute. You should hear the 3 phases being pulsed in turn. When finished the warning symbol disappears from the screen.
6. At this stage I would recommend testing the drive in Hand mode for: -
    - Direction. If wrong either isolate and swap the motor output phase connection, or use P1820=1 if you prefer not to change the wiring.
    - Are there any noise or vibration issues throughout the rev range? If so see the next section.
    - Can you achieve maximum speed without exceeding the rated FLA of the motor? If not you should investigate why. You may need to slow down the ramp up time (P1120), set the maximum speed (P1082) to a lower figure to prevent current warnings, or resize the v-belt pulley, fan blade pitch, or pump impeller. If all these options are out, you can install a larger motor and VSD to match the actual load.
    - Is the default maximum speed sufficient for the task? If not, and the motor current is below the FLA nameplate rating at 50Hz, you can increase the maximum motor speed in P1082. I would not recommend exceeding 60Hz unless you are sure the mechanical limitations of the system are not exceeded.

6.2.2 Additional & Optional Steps

1. If you want Start on the fly feature, select Parameters menu (leave in standard filter) and go to P1200 and set to 1.
2. If you want Auto Restart after mains failure or fault, select Parameters menu (leave in standard filter) and go to P1210 and set to 26.
3. If you want to avoid specific RPM bands due to noise or vibration issues, you can achieve this by selecting up to four speeds (P1091, P1092, P1093, P1094), and setting the width of these no-go areas in P1101.
4. If the motor is located in an environment that requires a low level of audible noise you can sometimes reduce the perceived noise level by increasing the pulse frequency of the VSD output. The default switching frequency is 4kHz, and can be increased in steps of 2kHz in P1800 up to 16kHz. Note that higher switching rates result in greater VSD losses in the form of heat, and so de-rates the maximum current capability. This de-rating also depends on the VSD size and the available maximum frequency values are reduced as the kW size increases. From a practical standpoint you should consider this information during the planning stage of the job.
5. In some cases you might need more starting torque (and therefore current) to get the motor spinning instead of stalling (the warning A7409 is shown during this event). The same is true if you need to accelerate the motor faster than the standard current limit will allow. You can override the default setting in P640, which governs the maximum motor current, and is normally set to 1.5 x FLA. The size of the power module compared to the motor FLA will determine how much of an increase is available. Note that by doing this you are artificially raising the overload safety level.
6. If you want to copy this program, then select Auto (not Hand), go to Extras menu and then to the 'To BOP' option. Select Yes. There will be a short wait while cloning parameters and zipping the file.
7. If you want to download this program to another drive of the same size (including motor data), then select Extras menu and go to the From BOP option, select Yes. There will be a short wait while downloading the parameters. When complete cycle the power and test the drive and motor for correct operation and direction.
8. If you want to add technological features then go to section **5.3 Typical HVAC Applications** and follow the instructions listed. If the application is not listed, please contact your Siemens Distributor for technical assistance.

6.2.3 Motor Nameplate Data

Setup menu
The setup menu is a fixed sequence of screens that allow the user to perform the basic commissioning of the Inverter.

Once a parameter value has been modified, there is no possibility to cancel the basic commissioning process. In this case, the basic commissioning process must be completed. If no parameter value has been modified, then a short press of ESC will return to the previous screen and a long press (more than 3 seconds) of ESC will return to the top of the Monitor menu.

When a parameter value has been modified and the new value confirmed by pressing OK, then the next parameter in the basic commissioning sequence is automatically displayed.

Editing parameters
Parameters can be modified use two methods; scrolling through the parameter values or using the single digit methods. Both these methods are described in section 7 of this manual.

Basic commissioning

Note: Maximum motor RPM (Parameter P1082)
The maximum motor RPM will not be required to be entered by the user during the basic commissioning process. The maximum motor RPM is automatically calculated during the motor calculation phase of basic commissioning. Should the user wish to view or edit parameter P1082, it is still available through the "Parameter" menu.

The basic commissioning process will require the input of data which is specific to the motor to which the Inverter is connected. The data regarding the attached motor can be gathered from the motor's rating plate. An example of a typical motor rating plate is shown in the figure below:

6.2.4 Setup Menu

The basic commissioning procedure is shown below.

Setup Menu

1. Using the ▲ and ▼ keys navigate to the Setup menu.
2. Press OK to start the basic commissioning sequence.

Reset

1. Using the ▲ and ▼ keys select Yes or No to reset the Inverter.
2. Press OK to confirm selection.
3. The display will automatically display the next parameter in the commissioning sequence.

The reset will be performed immediately. The reset will ensure that all parameter values are set to their default values before applying the new parameter values from the commissioning process.

Control mode

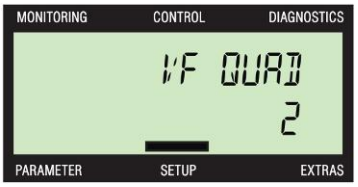
Sets the open and closed loop control mode of the Inverter.

1. Press OK to modify the parameter value.
2. Using the ▲ and ▼ keys scroll up or down the list until the required control mode is displayed.
3. Press OK to confirm the selected control mode.
4. The display will automatically display the next parameter in the commissioning sequence.

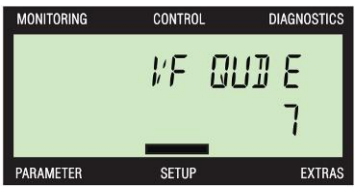
The available control modes are described below.

V/f control with linear characteristics. This is the factory default.

V/f control with parabolic (quadratic) characteristics. This is used with most Fans and Pumps due to their associated load curve.



V/f control for a parabolic (quadratic) characteristic and Energy Control Optimization (ECO). This can be used to save energy in non-dynamic, Fan and Pump type loads.



Motor data
Sets the regional settings for the motor, for example kW and Hz.

1. Press OK to modify the parameter value.
2. Using the ▲ and ▼ keys scroll up or down the list until the required units are displayed.
3. Press OK to confirm the selected value.
4. The display will automatically display the next parameter in the commissioning sequence.

Motor voltage
The input of the voltage from the rating label of the motor must correspond with the wiring of the motor (star/delta).

1. Press OK to modify the parameter value..
2. Using the ▲ and ▼ keys (or digit-by-digit method) increase or decrease the displayed value.
3. Press OK to confirm the selected value. The display will automatically display the next parameter in the commissioning sequence.

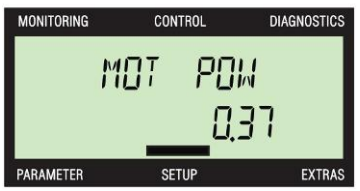
Motor current
Sets the value of the motor current in ampere taken from the motor rating plate.

1. Press OK to modify the parameter value.
2. Using the ▲ and ▼ keys (or digit-by-digit method) increase or decrease the displayed value.
3. Press OK to confirm the selected value. The display will automatically display the next parameter in the commissioning sequence.

Motor power
Sets the value of the motor power in kW or hp taken from the motor rating plate.

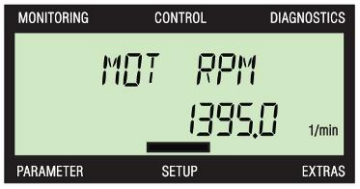
1. Press OK to modify the parameter value.
2. Using the ▲ and ▼ keys (or digit-by-digit method) increase or decrease the displayed value.
3. Press OK to confirm the selected value. The display will automatically display the next parameter in the commissioning sequence.

If P0100 = 0 or 2, data is in kW and if P0100 = 1, the data is in hp.



Motor speed
Sets the value of the motor speed in RPM taken from the motor rating plate.

1. Press OK to modify the parameter value.
2. Using the ▲ and ▼ keys (or digit-by-digit method) increase or decrease the displayed value.
3. Press OK to confirm the selected value. The display will automatically display the next parameter in the commissioning sequence.



Motor identification
Sets the motor data identification and speed controller optimization.

1. Press OK to modify the parameter value.
2. Using the ▲ and ▼ keys to scroll through the various options until the required setting is visible.
3. Press OK to confirm the selected value. The display will automatically display the next parameter in the commissioning sequence.

Motor identification will not start until the basic commissioning sequence has been completed.

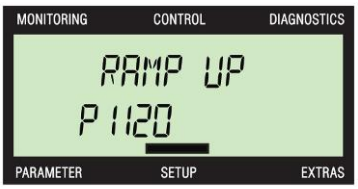
Macro Parameter
Skip over the MAc PAr option. This is a Macro parameter for automatically setting the basic interface I/O, and normally would not need to be changed, so leave P15 = 12.

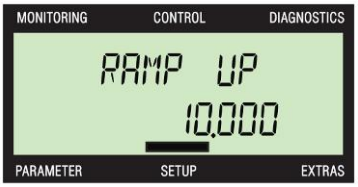
Minimum RPM
Sets the lowest speed to which the motor operates independently of the frequency setpoint.

1. Press OK to modify the parameter value.
2. Using the ▲ and ▼ keys (or digit-by-digit method) increase or decrease the displayed value.
3. Press OK to confirm the selected value. The display will automatically display the next parameter in the commissioning sequence.

Ramp up time
Set the time, in seconds, in which the motor should accelerate from standstill up to the maximum RPM set in P1082.

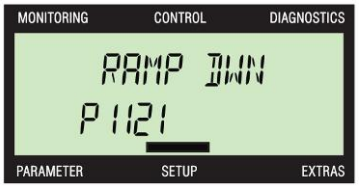
1. Press OK to modify the parameter value.
2. Using the ▲ and ▼ keys (or digit-by-digit method) increase or decrease the displayed value.
3. Press OK to confirm the selected value. The display will automatically display the next parameter in the commissioning sequence.

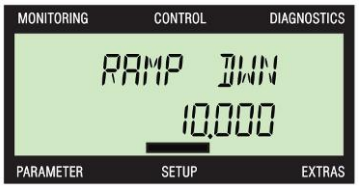




Ramp down time
Set the time, in seconds, in which the motor should decelerate from maximum RPM (P1082) down to a standstill.

1. Press OK to modify the parameter value.
2. Using the ▲ and ▼ keys (or digit-by-digit method) increase or decrease the displayed value.
3. Press OK to confirm the selected value. The display will automatically display the next parameter in the commissioning sequence.





Finish
Confirms the end of the commissioning process. The Inverter will perform a motor calculation change all the relevant parameters within the Control Module

1. Press OK to modify the parameter value.
2. Using the ▲ and ▼ keys to select Yes or No.
3. Press OK to confirm the selection and complete the commissioning process.

Busy
The display during the process of changing the parameter information of the Inverter will display "BUSY".

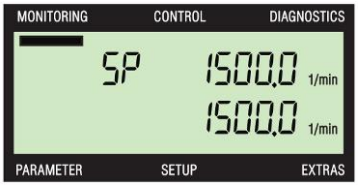
Done
When the commissioning process is completed, the BOP-2 will display "DONE". If a problem has occurred or there has been an interruption to the final process then the BOP-2 will display "FAILURE". Should this happen, the Inverter is to be considered unstable and the reason for the failure should be investigated and the commissioning process restarted.

At this point you are ready to test the motor. Refer back to point 5 in the Commissioning Steps on page 19.

6.2.5 Monitoring Screen

The details of the information displayed by the various monitoring screens are described below.

The default screen shows the value set for the setpoint, below this value the actual speed of the motor is displayed.



The voltage out screen displays the actual voltage output of the Inverter that is being supplied to the connected motor.

The DC Link screen displays the actual direct voltage across the DC Link terminals.

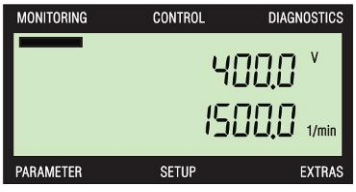
The current output screen shows the actual Inverter current output to the motor.

This screen shows the actual frequency (in Hz) at which the motor is running.

This screen displays the actual rotational speed of the motor in RPM and the actual output current of the Inverter to the motor.

The voltage and current screen displays the actual voltage being supplied by the Inverter to the motor and the actual current out of the Inverter to the motor.

The voltage and rpm screen display the actual voltage being supplied by the Inverter to the motor and the actual speed of the motor in rpm.



6.3 *Typical HVAC Applications*

The following list is comprised of common HVAC orientated applications, and should provide a useful starting point for most projects.

#0	-	Default 0-10V Speed Set-point Low Level Control
#1	-	4 Fixed Speeds & Fixed Speed Essential Services Mode
#2	-	0-10V Speed Set-point & Fixed Speed Essential Services Mode
#3	-	Single Zone Stairwell Pressurisation System
#4	-	Two Zone Stairwell Pressurisation System
#5	-	Multi-zone Stairwell using external SEZ220 signal selector
#6	-	Cooling Tower Fan using Internal PID & Hibernation Feature
#7*	-	Cooling Tower Fan with Hibernation & Cond Water Bypass
#8	-	Constant Pressure Control with Fixed Speed ESM (e.g. Multi-zone VAV App)
#9*	-	Single Zone Carpark Ventilation Standalone Solution
#10*	-	Two Zone Carpark Ventilation Standalone Solution
#11*	-	Three Zone Carpark Ventilation Standalone Solution
#12*	-	Condenser Pump Differential Pressure Control (e.g. multiple water cooled DX units)
#13*	-	CHW Pump Constant Flow Control using int PID & Chiller DP Sensor
#14*	-	CHW Pump Constant Flow Control using int PID & Magflow
#15*	-	Refrigerant Compressor (reciprocating) using HI Overload mode
#16*	-	Fieldbus example using BACnet
#17*	-	Fieldbus example using Modbus

* These applications are planned to be released on an on going basis.

Legend

Tan Colour	Notes and read only parameters
Light Green Colour	Quick commissioning parameters
Light Blue Colour	Optional parameters (enhancements), not necessary for every application
Dark Blue Colour	Special parameters
Pink Colour	In most instances do not change

Notes

Some of the parameters mentioned in the following applications can only be accessed via the Expert list. Ensure you select this when you enter the Parameter menu.

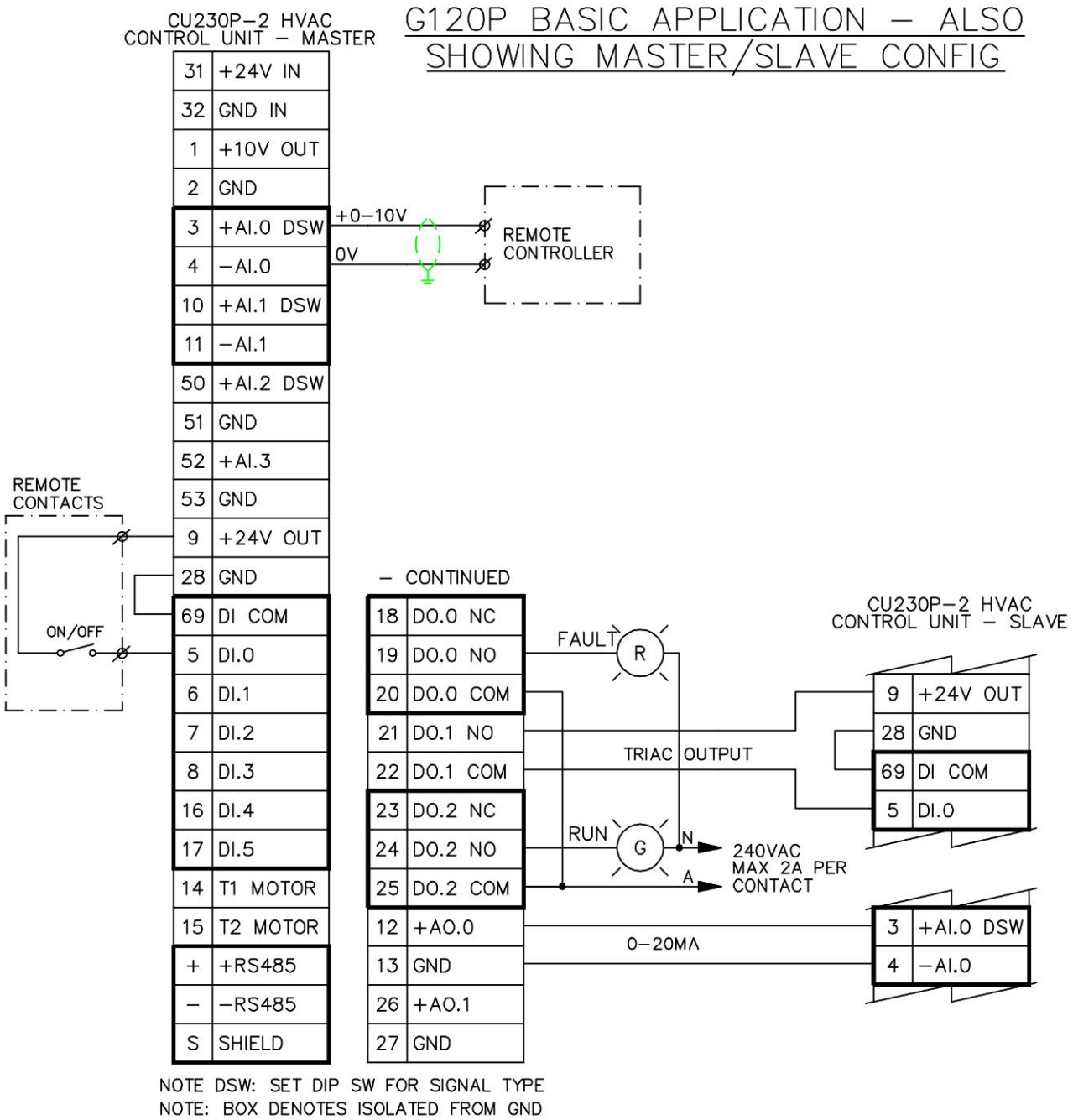
The Technological Units (PID loop) is a new feature of the current Control unit – firmware version 4.4. At date of compiling this guide, the BOP-2 does not show these units. This is also the case for the IOP, however a firmware upgrade will be released soon that will enable this feature. So currently the only way to see these Tech Units is via the fieldbus interface. For this reason it is not necessary to select the corresponding parameters P595 and P596 if you are only communicating to the drive via the BOP-2.

If you decide to use the Technological Units, there is a sequence that should be followed to enable this feature: -

1. Set P10 = 5
2. Set P596 = 100 (or the scaling factor recommended in the App sheet)
3. Set P595 = X (e.g. 1 = %, 4 = C, 5 = Pa, etc. - determined by your application)
4. Set P10 = 0
5. Continue with the parameters listed in the chosen application.

For additional information, please refer to the manuals listed in the Website Links section on page 6.

6.3.1 Application #0 - Default 0-10V Speed Set-point Low Level Control



DESCRIPTION

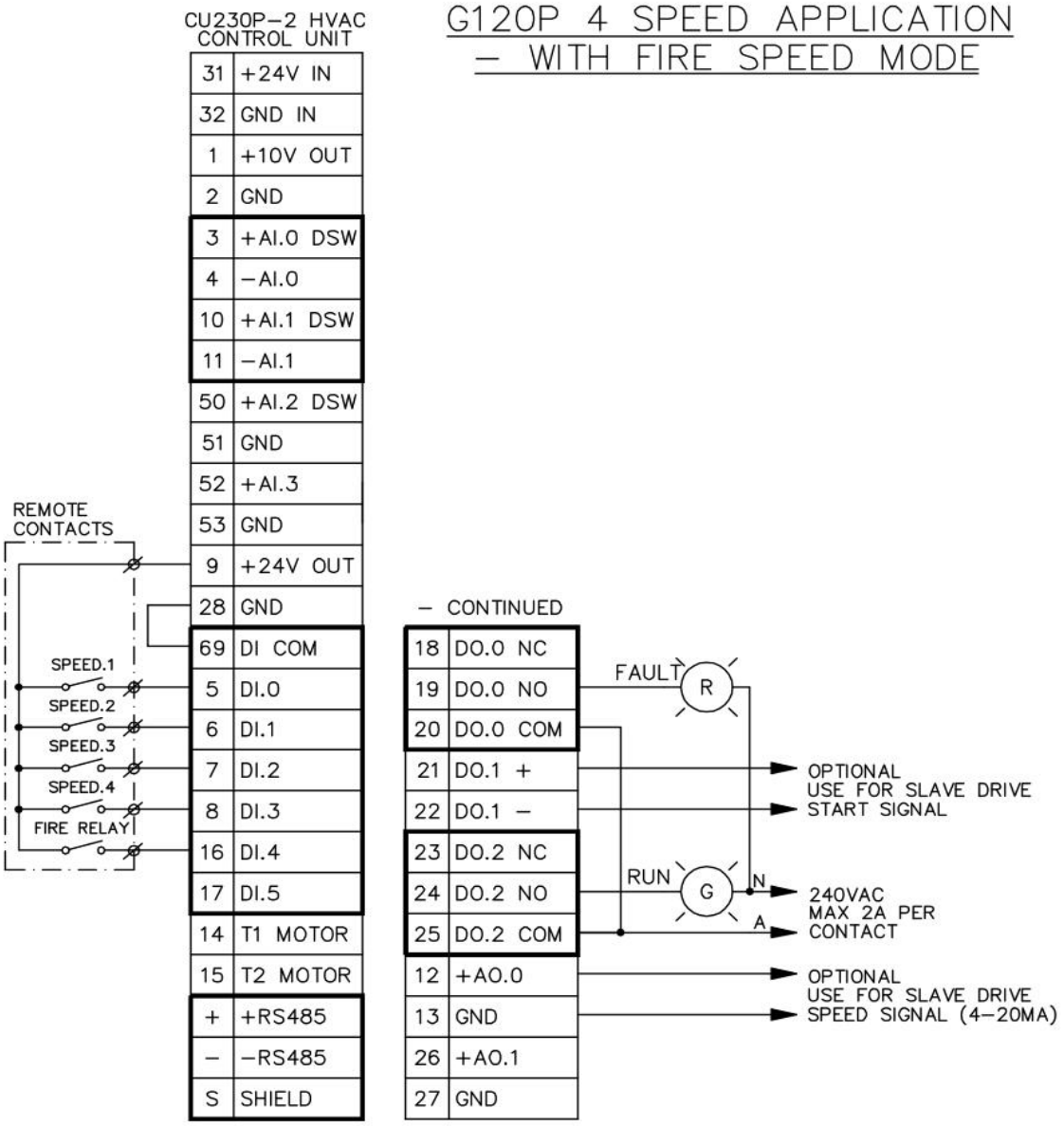
THIS IS HOW THE DRIVE IS CONTROLLED AFTER PERFORMING THE BASIC COMMISSIONING.

ALSO SHOWN IS A MASTER/SLAVE CONNECTION USING THE TRIAC OUTPUT (DO–1) FOR THE SLAVE DRIVE START SIGNAL. TO CHANGE THE DO–1 OUTPUT SET P731=52.2. THE DEFAULT ANALOG OUTPUT IS 0–20MA SO SET THE SLAVE DRIVE INPUT AI–0 TO MA BY P756(0)=2, AND SET THE DIP–SW TO ON (LEFT).

SEE NEXT PAGE FOR THE PARAMETER LIST. THE PARAMETERS AT THE END OF THE LIST STARTING WITH 'R' HAVE BEEN INCLUDED TO PROVIDE HANDY, READ–ONLY POINTS OF INTEREST TO MAKE COMMISSIONING EASIER.

Parameter	Parameter text	Parameter Value	Unit
Note: This parameter selects the HI/LO Overload mode for the power module. To change this you first need to set P10=1, and then back to 0 afterwards.			
p205	Power unit application	[0] Load duty cycle with high overload for vector drives	
Note: Set P210 = 440V for demo units. This is not normally needed with installed drives.			
p210	Drive unit line supply voltage	440	V
Note: To start motor commissioning, you must set P10 = 1			
p10	Drive commissioning parameter filter	[0] Ready	
Note: Parameter 15 calls a macro function that defines the basic command strategy of the drive. I would not recommend changing this from 12, as it can produce unwanted faults if set incorrectly.			
p15	Macro drive unit	12.) Standard I/O with AS	
p304[0]	Rated motor voltage	400	Vrms
p305[0]	Rated motor current	0.42	Arms
p307[0]	Rated motor power	0.12	kW
p308[0]	Rated motor power factor	0.79	
p309[0]	Rated motor efficiency	0	%
p310[0]	Rated motor frequency	50	Hz
p311[0]	Rated motor speed	1350	rpm
Note: Parameter 500 is a much simplified version of P1300, and if in doubt you can change this anytime.			
p500	Technology application	[0] Standard drive	
p700[0]	Command source selection	[0] No Macro	
Note: Digital Inputs Status			
r722	CO/BO: CU digital inputs, status	0000_0000_0000_0000_0000_1000_0000_0000B	
Note: Digital Outputs - setup & status			
p730	BI: CU signal source for terminal DO 0	Control_Unit : r52.3	
p731	BI: CU signal source for terminal DO 1	Control_Unit : r52.7	
p732	BI: CU signal source for terminal DO 2	Control_Unit : r52.2	
r747	CU, digital outputs status	0000_0000_0000_0000_0000_0000_0000_0000B	
Note: Analog Inputs - setup & status			
r755[0]	CU analog inputs actual value in percent, AI0 (T. 3/4)	72.04	%
p756[0]	CU analog inputs type, AI0 (T. 3/4)	[4] Bipolar voltage input (-10 V ... +10 V)	
Note: Analog Outputs - setup & status			
p771[0]	CU analog outputs signal source, AO0 (T 12/13)	Control_Unit : r21	
r774[0]	CU analog outputs output voltage/current actual, AO0 (T 12/13)	0	
p776[0]	CU analog outputs type, AO0 (T 12/13)	[0] Current output (0 mA ... +20 mA)	
Note: The following three parameters are the default internal connections for DI-0 to DI-2 respectively. To reassign these inputs you first have to 'unplug' these parameters by setting to zero.			
p840[0]	BI: ON / OFF (OFF1)	Control_Unit : r722.0	
p1113[0]	BI: Setpoint inversion	Control_Unit : r722.1	
p2103[0]	BI: 1. Acknowledge faults	Control_Unit : r722.2	
p1000[0]	Speed setpoint selection	[2] Analog setpoint	
Note: The Sinamics range of drives use RPM to define various values, and the Min speed is one of the most common. If in doubt, start with 300rpm and then fine-tune later.			
p1080[0]	Minimum speed	300	rpm
p1082[0]	Maximum speed	1500	rpm
Note: I would recommend setting the ramp-up & ramp-down values to 30 seconds initially, and fine tune as required.			
p1120[0]	Ramp-function generator ramp-up time	10	s
p1121[0]	Ramp-function generator ramp-down time	10	s
p1200[0]	FlyRest oper mode	[0] Flying restart inactive	
Note: Most customers prefer to set the drive to auto-restart after a fault or power failure. To accomplish this, set P1210 = 6. Note for high-level interface, additional steps may need to be taken.			
p1210	Automatic restart, mode	[0] Inhibit automatic restart	
Note: This parameter sets the load characteristic, but unlike P500, there are quite a few options and abbreviations. I would recommend option 2 for the majority of fans and pumps.			
p1300[0]	Open-loop/closed-loop control operating mode	[2] U/f control with parabolic characteristic	
Note: To finish motor commissioning (and reset other parameters), set P3900 = 1. If you do not want to reset other parameters, set P3900 = 3.			
p3900	Completion of quick commissioning	[0] No quick parameterization	

6.3.2 Application #1 - 4 Fixed Speeds & Fixed Speed ESM



NOTE DSW: SET DIP SW FOR SIGNAL TYPE
NOTE: BOX DENOTES ISOLATED FROM GND

DESCRIPTION

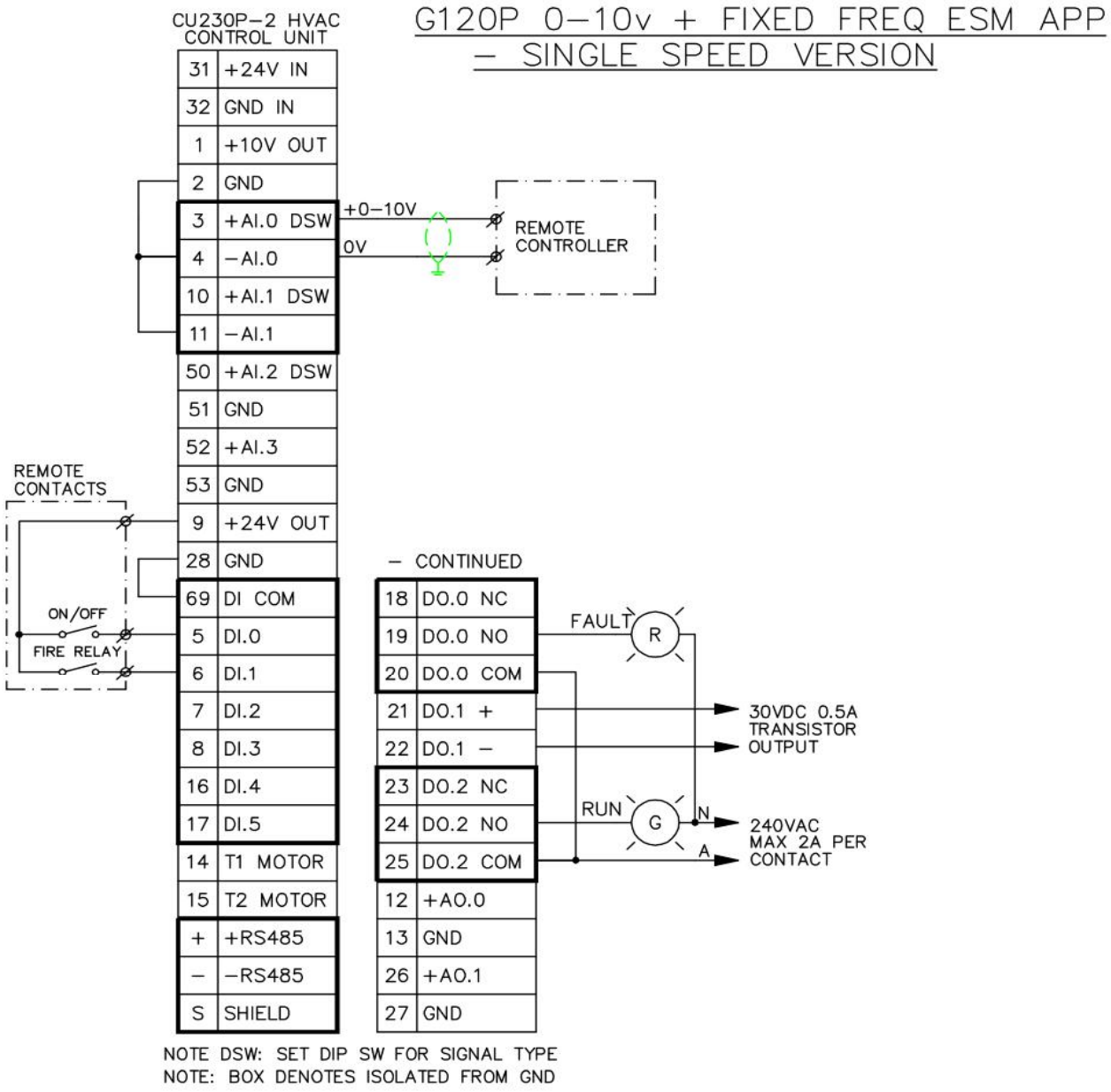
THIS IS A GENERAL PURPOSE MULTI–SPEED APPLICATION. ANY INPUT WILL START THE DRIVE, AND IT WILL RUN TO THE PROGRAMMED SPEED VALUES. NOTE THAT THE SETPOINTS ARE CUMULATIVE, SO ENSURE ONLY ONE INPUT IS ON AT A TIME OR THE SPEEDS WILL BE ADDED. THE ONLY EXCEPTION TO THIS IS THE ACTIVATION OF THE FIRE RELAY, WHICH WILL RUN TO THE SPEED SET IN P1015.

SEE NEXT PAGE FOR THE PARAMETER LIST. THE PARAMETERS AT THE END OF THE LIST STARTING WITH 'R' HAVE BEEN INCLUDED TO PROVIDE HANDY, READ–ONLY POINTS OF INTEREST TO MAKE COMMISSIONING EASIER.

ENSURE THE BASIC MOTOR COMMISSIONING HAS BEEN SUCCESSFULLY COMPLETED FIRST.

Parameter	Parameter text	Parameter Value	Unit
p840[0]	BI: ON / OFF (OFF1)	Control_Unit : r1025.0	
p1000[0]	Speed setpoint selection	[3] Fixed speed setpoint	
Note: Fixed Frequency setpoints are cumulative, so ensure external relay logic energizes one input at a time. The ESM overrides this rule and runs to the setpoint defined in P1015.			
p1001[0]	CO: Fixed speed setpoint 1	500	rpm
p1002[0]	CO: Fixed speed setpoint 2	750	rpm
p1003[0]	CO: Fixed speed setpoint 3	1000	rpm
p1004[0]	CO: Fixed speed setpoint 4	1250	rpm
p1015[0]	CO: Fixed speed setpoint 15	1500	rpm
p1020[0]	BI: Fixed speed setpoint selection Bit 0	Control_Unit : r722.0	
p1021[0]	BI: Fixed speed setpoint selection Bit 1	Control_Unit : r722.1	
p1022[0]	BI: Fixed speed setpoint selection Bit 2	Control_Unit : r722.2	
p1023[0]	BI: Fixed speed setpoint selection Bit 3	Control_Unit : r722.3	
p1113[0]	BI: Setpoint inversion	0	
p1210	Automatic restart, mode	[26] Acknowledging all faults and reclosing for an ON command	
p2103[0]	BI: 1. Acknowledge faults	0	
p3880	BI: ESM activation	Control_Unit : r722.4	
p3881	ESM setp source	[1] Fixed speed setpoint 15 (p1015)	
Note: The following read-only parameters are shown as handy points of interest. Do not try to program these into your drive.			
r722	CO/BO: CU digital inputs, status	0000_0000_0000_0000_0000_1000_0000_0000B	
r1024	CO: Fixed speed setpoint effective	0	rpm

6.3.3 Application #2 - 0-10V Speed Set-point & Fixed Speed ESM



DESCRIPTION

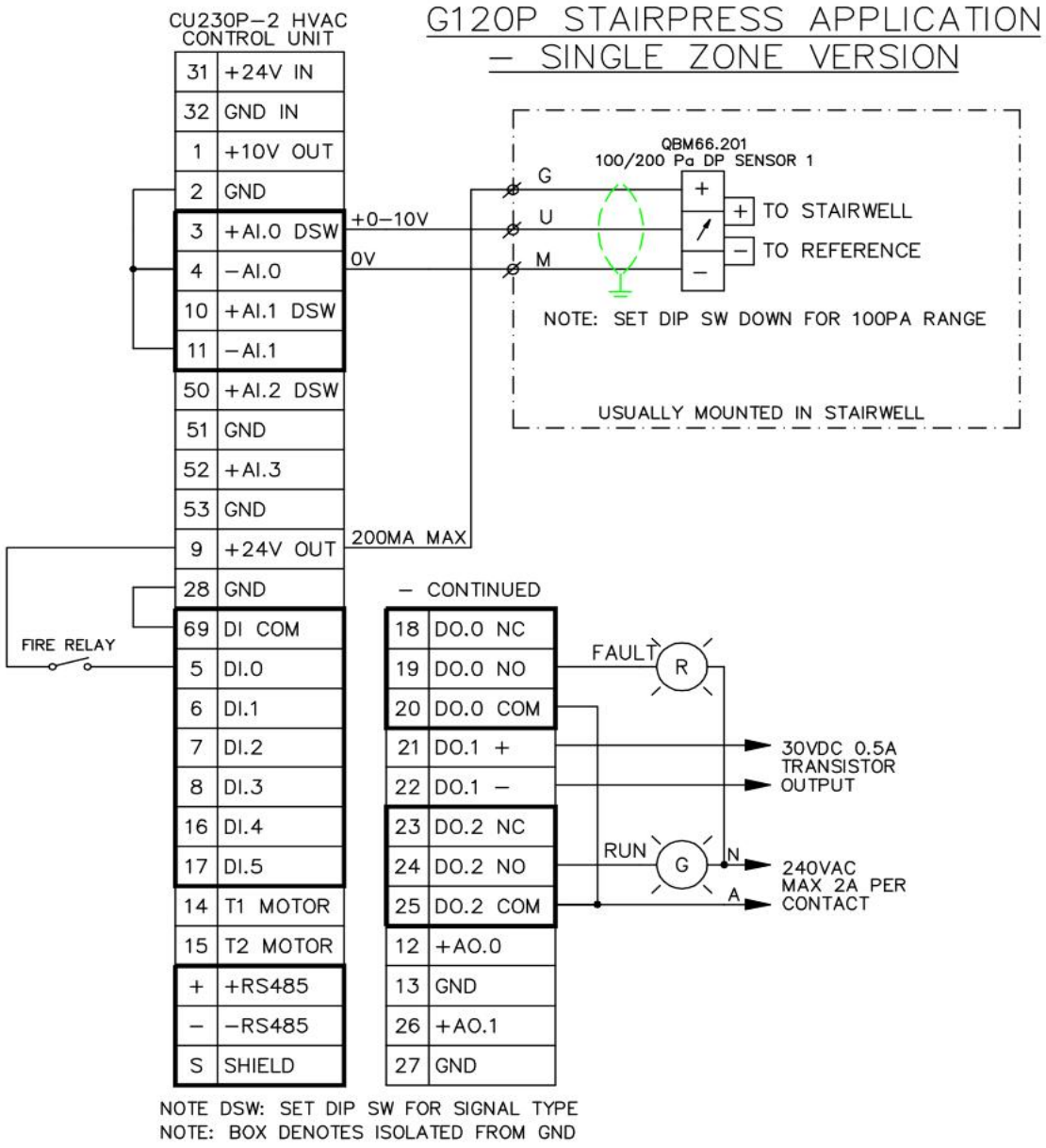
TYPICAL USAGE FOR THIS APPLICATION IS AN AHU SUPPLY FAN NORMALLY SPEED CONTROLLED BY A BMS OR OTHER EXTERNAL CONTROLLER. DURING FIRE MODE THIS SPEED IS OVERRIDDEN TO A FIXED SPEED DEFINED IN PARAMETER P1015, AND CAN BE CHANGED TO SUIT THE PARTICULAR JOB.

SEE NEXT PAGE FOR THE PARAMETER LIST. THE PARAMETERS AT THE END OF THE LIST STARTING WITH 'R' HAVE BEEN INCLUDED TO PROVIDE HANDY, READ–ONLY POINTS OF INTEREST TO MAKE COMMISSIONING EASIER.

ENSURE THE BASIC MOTOR COMMISSIONING HAS BEEN SUCCESSFULLY COMPLETED FIRST.

Parameter	Parameter text	Parameter Value	Unit
p1015[0]	CO: Fixed speed setpoint 15	1350	rpm
p1113[0]	BI: Setpoint inversion	0	
p1210	Automatic restart, mode	[26] Acknowledging all faults and reclosing for an ON command	
p2103[0]	BI: 1. Acknowledge faults	0	
p3880	BI: ESM activation	Control_Unit : r722.1	
p3881	ESM setp source	[1] Fixed speed setpoint 15 (p1015)	
Note: The following read-only parameters are shown as handy points of interest. Do not try to program these into your drive.			
r755[0]	CU analog inputs actual value in percent, AI0 (T. 3/4)	71.48	%
r722	CO/BO: CU digital inputs, status	0000_0000_0000_0000_0000_1000_0000_0000B	

6.3.4 Application #3 - Stairwell Pressurisation System



DESCRIPTION

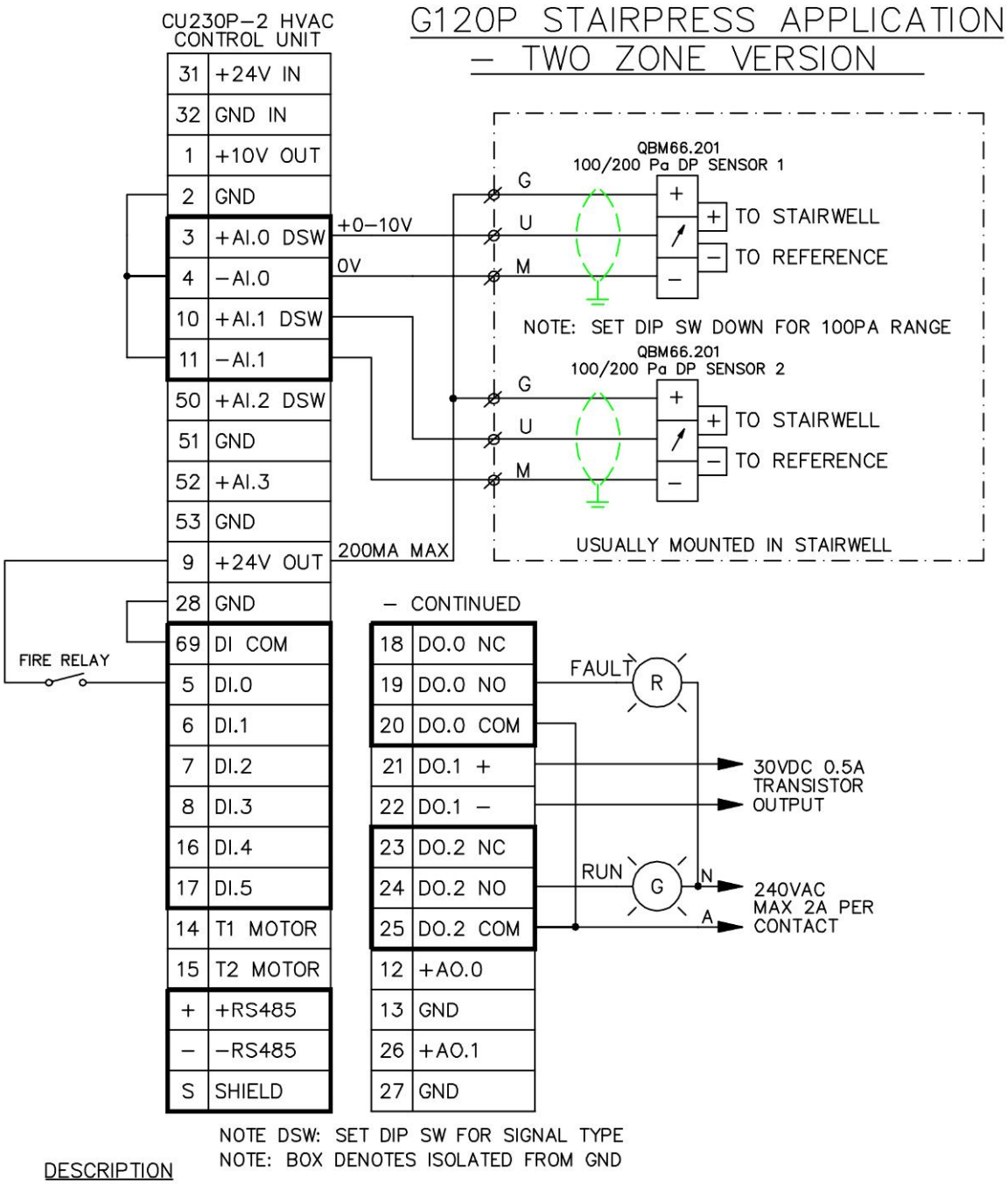
STAIRWELL PRESSURIZATION IS NORMALLY TRIGGERED BY A FIRE ALARM CONTACT. THE DRIVE IS SET FOR ESSENTIAL SERVICES MODE, WHICH OPTIMIZES THE RUN TIME BY MODIFYING THE FAULT REACTION. ONCE ENABLED THE DRIVE WILL CONTROL THE FAN TO MAINTAIN A SET PRESSURE WITHIN THE STAIRWELL.

THE CONTROL PARAMETERS LIKE SETPOINT (P2201), PROPORTIONAL GAIN (P2280), AND INTEGRAL TIME (P2285) MAY NEED TO BE ADAPTED TO SUIT THE PARTICULAR JOB. SEE NEXT PAGE FOR THE PARAMETER LIST. THE PARAMETERS AT THE END OF THE LIST STARTING WITH 'R' HAVE BEEN INCLUDED TO PROVIDE HANDY, READ–ONLY POINTS OF INTEREST TO MAKE COMMISSIONING EASIER.

ENSURE THE BASIC MOTOR COMMISSIONING HAS BEEN SUCCESSFULLY COMPLETED FIRST.

Parameter	Parameter text	Parameter Value	Unit
Note: To change P0595 you first need to set P0010 = 5, and then set P0010 back to 0 afterwards.			
p595	Selecting technological units	[5] Pa	
p596	Reference quantity, technological units	100	
p753[0]	CU analog inputs smoothing time constant, AI0 (T. 3/4)	500	ms
Note: The Ramp-up, Ramp-down, and Minimum Speed parameters are shown for the tuning process of the actual stair-press system, and may have to be adjusted to suit.			
p1080[0]	Minimum speed	450	rpm
p1120[0]	Ramp-function generator ramp-up time	30	s
p1121[0]	Ramp-function generator ramp-down time	30	s
p1210	Automatic restart, mode	[26] Acknowledging all faults and reclosing for an ON command	
p2200[0]	BI: Technology controller enable	Control_Unit : r722.0	
p2201[0]	CO: Technology controller, fixed value 1	40	Pa
p2253[0]	CI: Technology controller setpoint 1	Control_Unit : p2201	
p2264[0]	CI: Technology controller actual value	Control_Unit : r755[0]	
p2267	Technology controller upper limit actual value	120	Pa
p2268	Technology controller lower limit actual value	-10	Pa
Note: The Prop gain and Integral time parameters are shown for the tuning process of the actual stair-press system, and may have to be adjusted to suit.			
p2280	Technology controller proportional gain	1.2	
p2285	Technology controller integral time	25	s
Note: Set the PID Loop minimum output value to match the minimum motor speed (P1080). For example; 30% for 15Hz (when the max speed is 50Hz).			
p2292	CO: Technology controller minimum limiting	30	%
p2302	Technology controller output signal starting value	35	%
p3880	BI: ESM activation	Control_Unit : r722.0	
p3881	ESM setp source	[4] Setpoint from technology controller	
p3884	CI: ESM setpoint technology controller	Control_Unit : p2201	
Note: The following read-only parameters are shown as handy points of interest. Do not try to program these into your drive.			
r755[0]	CU analog inputs actual value in percent, AI0 (T. 3/4)	71.34	%
r2260	CO: Technology controller setpoint after ramp-function generator	40	Pa
r2272	CO: Technology controller actual value scaled	71.34	Pa
r2273	CO: Technology controller error	-31.34	Pa
r2294	CO: Technology controller output signal	0	%

6.3.5 Application #4 - Two Zone Stairwell Pressurisation System



NOTE DSW: SET DIP SW FOR SIGNAL TYPE
NOTE: BOX DENOTES ISOLATED FROM GND

DESCRIPTION

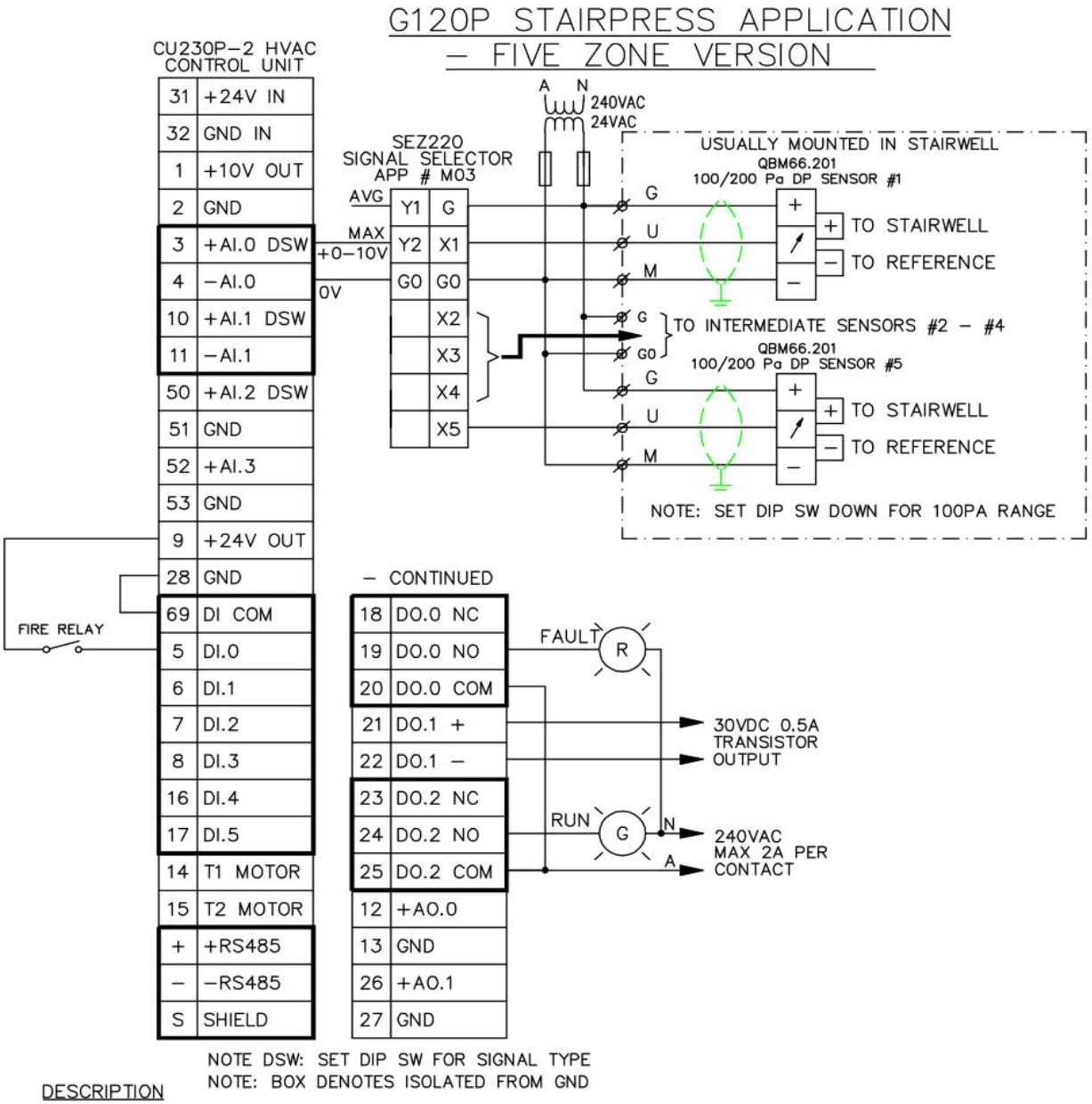
STAIRWELL PRESSURIZATION IS NORMALLY TRIGGERED BY A FIRE ALARM CONTACT. THE DRIVE IS SET FOR ESSENTIAL SERVICES MODE, WHICH OPTIMIZES THE RUN TIME BY MODIFYING THE FAULT REACTION. ONCE ENABLED THE DRIVE WILL CONTROL THE FAN TO MAINTAIN A SET PRESSURE WITHIN THE STAIRWELL. FOR TWO OR MORE SENSORS, IT IS USUAL FOR THE HIGHEST VALUE TO PROVIDE THE CONTROL, HOWEVER IF THE AVERAGE OR LOWEST SIGNAL IS REQUIRED, THIS CAN BE SELECTED VIA P31022.

THE CONTROL PARAMETERS LIKE SETPOINT (P2201), PROPORTIONAL GAIN (P2280), AND INTEGRAL TIME (P2285) MAY NEED TO BE ADAPTED TO SUIT THE PARTICULAR JOB. SEE NEXT PAGE FOR THE PARAMETER LIST. THE PARAMETERS AT THE END OF THE LIST STARTING WITH 'R' HAVE BEEN INCLUDED TO PROVIDE HANDY, READ–ONLY POINTS OF INTEREST TO MAKE COMMISSIONING EASIER.

ENSURE THE BASIC MOTOR COMMISSIONING HAS BEEN SUCCESSFULLY COMPLETED FIRST.

Parameter	Parameter text	Parameter Value	Unit
Note: To change P0595 you first need to set P0010 = 5, and then set P0010 back to 0 afterwards.			
p595	Selecting technological units	[5] Pa	
p596	Reference quantity, technological units	100	
p753	CU analog inputs smoothing time constant		
p753[0]	AI0 (T. 3/4)	500	ms
p753[1]	AI1 (T. 10/11)	500	ms
p753[2]	AI2 (T. 50/51)	0	ms
p753[3]	AI3 (T. 52/53)	0	ms
p756	CU analog inputs type		
p756[0]	AI0 (T. 3/4)	[0] Unipolar voltage input (0 V ... +10 V)	
p756[1]	AI1 (T. 10/11)	[0] Unipolar voltage input (0 V ... +10 V)	
p756[2]	AI2 (T. 50/51)	[8] No sensor connected	
p756[3]	AI3 (T. 52/53)	[8] No sensor connected	
Note: The Ramp-up, Ramp-down, and Minimum Speed parameters are shown for the tuning process of the actual stair-press system, and may have to be adjusted to suit.			
p1080[0]	Minimum speed	450	rpm
p1120[0]	Ramp-function generator ramp-up time	30	s
p1121[0]	Ramp-function generator ramp-down time	30	s
p1210	Automatic restart, mode	[26] Acknowledging all faults and reclosing for an ON command	
p2200[0]	BI: Technology controller enable	Control_Unit : r722.0	
p2201[0]	CO: Technology controller, fixed value 1	40	Pa
p2267	Technology controller upper limit actual value	120	Pa
p2268	Technology controller lower limit actual value	-10	Pa
Note: The Prop gain and Integral time parameters are shown for the tuning process of the actual stair-press system, and may have to be adjusted to suit.			
p2280	Technology controller proportional gain	1.2	
p2285	Technology controller integral time	25	s
Note: Set the PID Loop minimum output value to match the minimum motor speed (P1080). For example; 30% for 15Hz (when the max speed is 50Hz).			
p2292	CO: Technology controller minimum limiting	30	%
p2302	Technology controller output signal starting value	35	%
p3880	BI: ESM activation	Control_Unit : r722.0	
p3881	ESM setp source	[4] Setpoint from technology controller	
p3884	CI: ESM setpoint technology controller	Control_Unit : p2201	
p31020	Multi-zone control interconnection	[1] Interconnecting multi-zone control	
p31021	Multi-zone control configuration	[0] Setpoint 1 / multiple actual values	
p31022	Multi-zone control for actual value processing	[10] Maximum (actual value 1, 2)	
p31025	BI: Multi-zone control day/night switchover	0	
p31026	CI: Multi-zone control actual-value input		
p31026[0]	CI: Multi-zone control actual-value input	Control_Unit : r755[0]	
p31026[1]	CI: Multi-zone control actual-value input	Control_Unit : r755[1]	
p31026[2]	CI: Multi-zone control actual-value input	0	
p31023[0]	CI: Multi-zone control setpoint input	Control_Unit : p2201	
Note: The following read-only parameters are shown as handy points of interest. Do not try to program these into your drive.			
r755	CO: CU analog inputs actual value in percent		
r755[0]	CU analog inputs actual value in percent, AI0 (T. 3/4)	71.36	%
r755[1]	CU analog inputs actual value in percent, AI1 (T. 10/11)	80.4	%
r755[2]	CU analog inputs actual value in percent, AI2 (T. 50/51)	0	%
r755[3]	CU analog inputs actual value in percent, AI3 (T. 52/53)	0	%
r2260	CO: Technology controller setpoint after ramp-function generator	40	Pa
r2272	CO: Technology controller actual value scaled	80.41	Pa
r2294	CO: Technology controller output signal	0	%
r31027	CO: Multi-zone control actual-value output	80.41	%

6.3.6 Application #5 - Multi-zone Stairwell using SEZ220 signal selector



DESCRIPTION

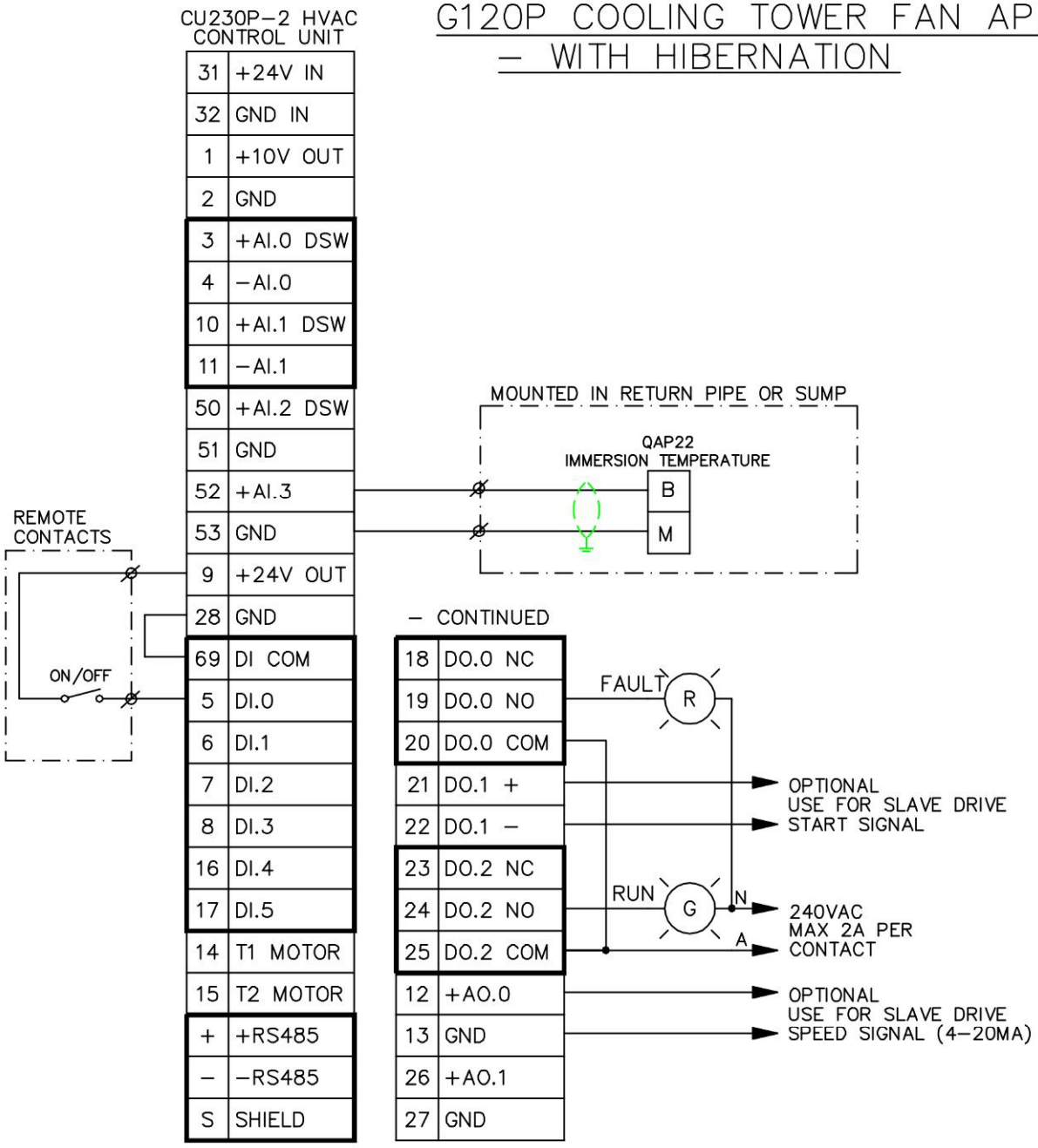
STAIRWELL PRESSURIZATION IS NORMALLY TRIGGERED BY A FIRE ALARM CONTACT. THE DRIVE IS SET FOR ESSENTIAL SERVICES MODE, WHICH OPTIMIZES THE RUN TIME BY MODIFYING THE FAULT REACTION. ONCE ENABLED THE DRIVE WILL CONTROL THE FAN TO MAINTAIN A SET PRESSURE WITHIN THE STAIRWELL. FOR TWO OR MORE SENSORS, IT IS USUAL FOR THE HIGHEST VALUE TO PROVIDE THE CONTROL, HOWEVER IF THE AVERAGE SIGNAL IS REQUIRED, THIS CAN BE SELECTED VIA Y1 OUTPUT ON THE SEZ220.

THE CONTROL PARAMETERS LIKE SETPOINT (P2201), PROPORTIONAL GAIN (P2280), AND INTEGRAL TIME (P2285) MAY NEED TO BE ADAPTED TO SUIT THE PARTICULAR JOB. SEE NEXT PAGE FOR THE PARAMETER LIST. THE PARAMETERS AT THE END OF THE LIST STARTING WITH 'R' HAVE BEEN INCLUDED TO PROVIDE HANDY, READ–ONLY POINTS OF INTEREST TO MAKE COMMISSIONING EASIER.

ENSURE THE BASIC MOTOR COMMISSIONING HAS BEEN SUCCESSFULLY COMPLETED FIRST.

Parameter	Parameter text	Parameter Value	Unit
Note: To change P0595 you first need to set P0010 = 5, and then set P0010 back to 0 afterwards.			
p595	Selecting technological units	[5] Pa	
p596	Reference quantity, technological units	100	
p753[0]	CU analog inputs smoothing time constant, AI0 (T. 3/4)	500	ms
Note: The Ramp-up, Ramp-down, and Minimum Speed parameters are shown for the tuning process of the actual stair-press system, and may have to be adjusted to suit.			
p1080[0]	Minimum speed	450	rpm
p1120[0]	Ramp-function generator ramp-up time	30	s
p1121[0]	Ramp-function generator ramp-down time	30	s
p1210	Automatic restart, mode	[26] Acknowledging all faults and reclosing for an ON command	
p2200[0]	BI: Technology controller enable	Control_Unit : r722.0	
p2201[0]	CO: Technology controller, fixed value 1	40	Pa
p2253[0]	CI: Technology controller setpoint 1	Control_Unit : p2201	
p2264[0]	CI: Technology controller actual value	Control_Unit : r755[0]	
p2267	Technology controller upper limit actual value	120	Pa
p2268	Technology controller lower limit actual value	-10	Pa
Note: The Prop gain and Integral time parameters are shown for the tuning process of the actual stair-press system, and may have to be adjusted to suit.			
p2280	Technology controller proportional gain	1.2	
p2285	Technology controller integral time	25	s
Note: Set the PID Loop minimum output value to match the minimum motor speed (P1080). For example; 30% for 15Hz (when the max speed is 50Hz).			
p2292	CO: Technology controller minimum limiting	30	%
p2302	Technology controller output signal starting value	35	%
p3880	BI: ESM activation	Control_Unit : r722.0	
p3881	ESM setp source	[4] Setpoint from technology controller	
p3884	CI: ESM setpoint technology controller	Control_Unit : p2201	
Note: The following read-only parameters are shown as handy points of interest. Do not try to program these into your drive.			
r755[0]	CU analog inputs actual value in percent, AI0 (T. 3/4)	71.34	%
r2260	CO: Technology controller setpoint after ramp-function generator	40	Pa
r2272	CO: Technology controller actual value scaled	71.34	Pa
r2273	CO: Technology controller error	-31.34	Pa
r2294	CO: Technology controller output signal	0	%

6.3.7 Application #6 - Cooling Tower Fan using Int. PID & Hibernation Feature



NOTE DSW: SET DIP SW FOR SIGNAL TYPE
NOTE: BOX DENOTES ISOLATED FROM GND

DESCRIPTION

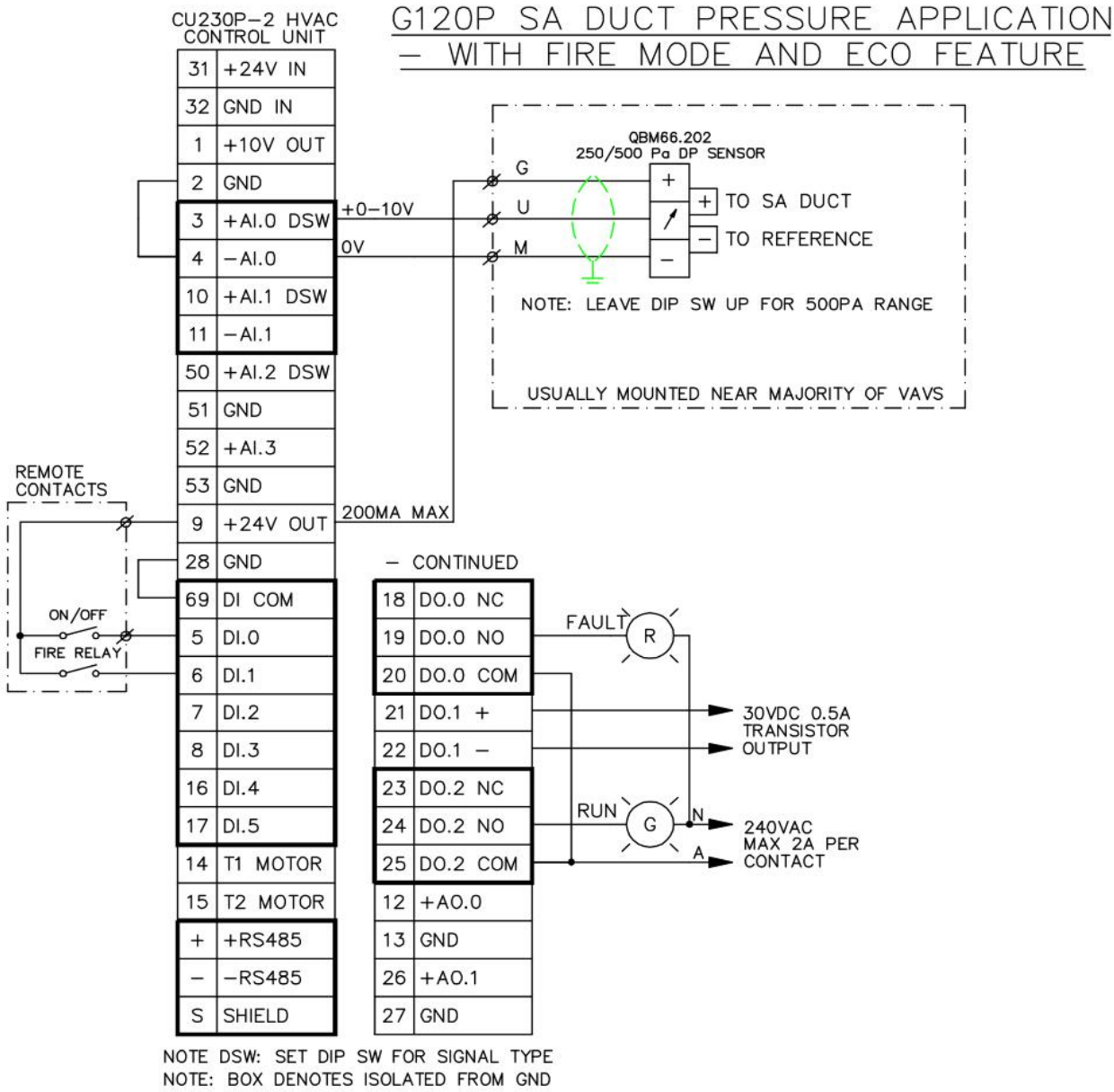
TYPICAL USAGE FOR THIS APPLICATION IS TEMPERATURE CONTROL OF RETURN WATER TO A CHILLER OR CONDENSER WATER RETICULATION SYSTEM BY COOLING TOWER FAN SPEED CONTROL. THIS APP ALSO UTILIZES THE HIBERNATION FEATURE WHICH ALLOWS A MINIMUM MOTOR SPEED TO BE USED TO PROTECT THE MOTOR FROM STALLING AND OVERHEATING, WHILE CYCLING THE MOTOR SHOULD THE RETURN WATER DROP BELOW THE SETPOINT FOR A DEFINED PERIOD (P2391). DURING THIS TIME AN ALARM WILL SHOW ON THE SCREEN TO WARN OF POSSIBLE RESTART. WHEN THE ACTUAL TEMPERATURE EXCEEDS THE SETPOINT (P2201) BY ONE DEGREE (P2392), THE MOTOR WILL RESTART TO MAINTAIN CONDITIONS.

SEE NEXT PAGE FOR THE PARAMETER LIST. THE PARAMETERS AT THE END OF THE LIST STARTING WITH 'R' HAVE BEEN INCLUDED TO PROVIDE HANDY, READ–ONLY POINTS OF INTEREST TO MAKE COMMISSIONING EASIER.

ENSURE THE BASIC MOTOR COMMISSIONING HAS BEEN SUCCESSFULLY COMPLETED FIRST.

Parameter	Parameter text	Parameter Value	Unit
Note: To change P0595 you first need to set P0010 = 5, and then set P0010 back to 0 afterwards.			
p595	Selecting technological units	[4] °C	
p596	Reference quantity, technological units	100	
p753	CU analog inputs smoothing time constant		
p753[0]	AI0 (T. 3/4)	0	ms
p753[1]	AI1 (T. 10/11)	0	ms
p753[2]	AI2 (T. 50/51)	0	ms
p753[3]	AI3 (T. 52/53)	100	ms
p756	CU analog inputs type		
p756[0]	AI0 (T. 3/4)	[0] Unipolar voltage input (0 V ... +10 V)	
p756[1]	AI1 (T. 10/11)	[0] Unipolar voltage input (0 V ... +10 V)	
p756[2]	AI2 (T. 50/51)	[2] Unipolar current input (0 mA ... +20 mA)	
p756[3]	AI3 (T. 52/53)	[6] Temperature sensor Ni1000	
Note: Set P1080 to around 20% of maximum motor RPM (P0311) - i.e. above stalling speed.			
p1080[0]	Minimum speed	300	rpm
p1120[0]	Ramp-function generator ramp-up time	30	s
p1121[0]	Ramp-function generator ramp-down time	30	s
p1210	Automatic restart, mode	[26] Acknowledging all faults and reclosing for an ON command	
p2200[0]	BI: Technology controller enable	Control_Unit : r722.0	
p2201[0]	CO: Technology controller, fixed value 1	26	°C
p2253[0]	CI: Technology controller setpoint 1	Control_Unit : p2201	
p2264[0]	CI: Technology controller actual value	Control_Unit : r755[3]	
p2267	Technology controller upper limit actual value	100	°C
p2268	Technology controller lower limit actual value	-10	°C
p2280	Technology controller proportional gain	1.2	
p2285	Technology controller integral time	25	s
p2292	CO: Technology controller minimum limiting	20	%
p2306	Technology controller fault signal inversion	[1] Inversion	
p2390[0]	Hibernation starting speed	50	rpm
p2391[0]	Hibernation delay time	60	s
p2392	Hibernation restart value with technology controller	1	°C
p2393[0]	Hibernation restart speed relative w/o technology controller	100	rpm
p2398	Hibernation operating mode	[1] Hibernation active	
Note: The following read-only parameters are shown as handy points of interest. Do not try to program these into your drive.			
r2260	CO: Technology controller setpoint after ramp-function generator	26	°C
r2272	CO: Technology controller actual value scaled	-0.14	°C
r2294	CO: Technology controller output signal	0	%
Optional. Use the following parameters to prevent nuisance fault output during Hibernation trip and ramp down. They introduce a 10 second delay before any fault is output on DO-0.			
p730	BI: CU signal source for terminal DO 0	Control_Unit : r20160.0	
p20158	BI: PDE 0 input pulse I	Control_Unit : r52.3	
p20159	PDE 0 pulse delay time in ms	10000	
r20160	BO: PDE 0 output Q	0	
p20161	PDE 0 run-time group	[5] Run-time group 5	
p20162	PDE 0 run sequence	430	

6.3.8 Application #8 - Constant Pressure Control with Fixed Speed ESM



DESCRIPTION

IN NORMAL MODE THE INTERNAL PID LOOP CONTROLS THE SUPPLY FAN BASED ON DUCT PRESSURE. THE CONTROL PARAMETERS LIKE SETPOINT (P2201), PROPORTIONAL GAIN (P2280), AND INTEGRAL TIME (P2285) MAY NEED TO BE ADAPTED TO SUIT THE PARTICULAR JOB.

WHEN THE FIRE RELAY IS ENABLED, THE DRIVE IS SET FOR ESSENTIAL SERVICES MODE, WHICH OPTIMIZES THE RUN TIME BY MODIFYING THE FAULT REACTION, AND THE DRIVE WILL RUN TO A SET SPEED – DEFINED IN P1015. THIS IS INDEPENDANT OF THE ON/OFF INPUT.

SEE NEXT PAGE FOR THE PARAMETER LIST. THE PARAMETERS AT THE END OF THE LIST STARTING WITH 'R' HAVE BEEN INCLUDED TO PROVIDE HANDY, READ-ONLY POINTS OF INTEREST TO MAKE COMMISSIONING EASIER.

ENSURE THE BASIC MOTOR COMMISSIONING HAS BEEN SUCCESSFULLY COMPLETED FIRST.

Parameter	Parameter text	Parameter Value	Unit
Note: To change P0595 you first need to set P0010 = 5, and then set P0010 back to 0 afterwards.			
p595	Selecting technological units	[5] Pa	
p596	Reference quantity, technological units	500	
p753[0]	CU analog inputs smoothing time constant, AI0 (T. 3/4)	500	ms
p756[0]	CU analog inputs type, AI0 (T. 3/4)	[0] Unipolar voltage input (0 V ... +10 V)	
p1015[0]	CO: Fixed speed setpoint 15	1350	rpm
p1080[0]	Minimum speed	300	rpm
p1113[0]	BI: Setpoint inversion	0	
p1210	Automatic restart, mode	[26] Acknowledging all faults and reclosing for an ON command	
Note: When using ECO mode, set P1335 = 100% to enable slip compensation for correct operation.			
p1300[0]	Open-loop/closed-loop control operating mode	[7] U/f control for a parabolic characteristic and ECO	
p1335[0]	Slip compensation, scaling	100	%
p2200[0]	BI: Technology controller enable	Control_Unit : r722.0	
Note: Set pressure setpoint to suit application. This example assumes a 0-500Pa range sensor is used (e.g. QBM66.202 hi-range).			
p2201[0]	CO: Technology controller, fixed value 1	200	Pa
p2253[0]	CI: Technology controller setpoint 1	Control_Unit : p2201	
p2264[0]	CI: Technology controller actual value	Control_Unit : r755[0]	
p2267	Technology controller upper limit actual value	600	Pa
p2268	Technology controller lower limit actual value	-50	Pa
p2280	Technology controller proportional gain	1.1	
p2285	Technology controller integral time	35	s
p2292	CO: Technology controller minimum limiting	20	%
p2302	Technology controller output signal starting value	50	%
p3880	BI: ESM activation	Control_Unit : r722.1	
p3881	ESM setp source	[1] Fixed speed setpoint 15 (p1015)	
Note: The following read-only parameters are shown as handy points of interest. Do not try to program these into your drive.			
r755[0]	CU analog inputs actual value in percent, AI0 (T. 3/4)	71.34	%
r2260	CO: Technology controller setpoint after ramp-function generator	200	Pa
r2272	CO: Technology controller actual value scaled	356.72	Pa
r2294	CO: Technology controller output signal	0	%

7 Troubleshooting

7.1 *Diagnostic Menu*

The Diagnostics menu allows the user to access the following function:

- Acknowledge all faults
- Faults
- History
- Status

To access the Diagnostics menu, the following actions should be performed:

1. Using the ▲ and ▼ keys navigate to the Diagnostics screen.
2. Press OK to select the Diagnostics menu.
3. Using the ▲ and ▼ keys select the required screen.
4. Press OK to display the selected screen.

   Pressing ESC for more than 3 seconds at any point during this sequence will cause the BOP-2 to return to the status screen. A short press of the ESC key will cause the BOP-2 to return to the previous screen.

The individual functions are described below.

7.1.1 Acknowledge faults

When a fault condition occurs within the Inverter/motor system; the system is stopped by the Inverter and requires that all faults are acknowledged before restarting the system.

To acknowledge all active faults within the Inverter/motor system, the following procedure should be performed:

1. Using the ▲ and ▼ keys navigate to the Diagnostics screen.
2. Press OK to select the Diagnostics menu.
3. Using the ▲ and ▼ keys select ACKN ALL screen.
4. Press OK to acknowledge all active faults.
5. The BOP-2 will automatically return to the top level diagnostic menu.

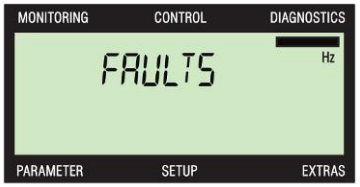
   Pressing ESC for more than 3 seconds at any point during this sequence will cause the BOP-2 to return to the status screen. A short press of the ESC key will cause the BOP-2 to return to the previous screen.

7.1.2 Active faults and alarms

When the Inverter detects a fault or alarm condition it maintains a list of all the currently active faults and alarms. For a detailed explanation of the displayed fault and alarm numbers, please refer to the relevant Parameter List.

To see which faults and alarms are currently active, the following procedure should be performed:

1. Using the ▲ and ▼ keys navigate to the Diagnostics screen.
2. Press OK to select the Diagnostics menu.
3. Using the ▲ and ▼ keys select the FAULTS screen.
4. Press OK to display the selected screen.
5. Using the ▲ and ▼ keys scroll through the faults and alarm list.
6. Press OK to clear faults.
7. Press ESC will return the BOP-2 to the ACKN ALL screen.



Note:
If a fault occurs, the dynamic fault screen will be displayed automatically.

7.1.3 History

The History option within the Diagnostics menu maintains a list of the last 64 faults that have occurred within the Inverter/motor system. For a detailed explanation of the displayed fault and alarm numbers, please refer to the relevant Parameter List.

To access the History option, the following procedure should be performed:

1. Using the ▲ and ▼ keys navigate to the Diagnostics screen.
2. Press OK to select the Diagnostics menu.
3. Using the ▲ and ▼ keys select the HISTORY screen.
4. Press OK to display the selected screen.
5. Using the ▲ and ▼ keys scroll up or down through the list of recorded faults and alarms.
6. Press ESC to return to the Diagnostic top level menu.

7.2 *Fault and Warning List*

The following is a condensed list of possible faults and warnings you may encounter.

If the number you are searching for is not listed or you require a more detailed explanation, please refer to the same section at the back of the Parameter Manual.

This manual can be found and downloaded as shown in the Website link section on page 6.

Number	Cause	Remedy
F01018	Power-up aborted more than once	1. Switch the module off and on again. 2. After this fault has been output, the module is booted with the factory settings. 3. Recommission the inverter.
A01028	Configuration error	Explanation: Parameterization on the memory card has been created with a different type of module (order number, MLFB) Check the module parameters and recommission if necessary.
F01033	Unit switchover: Reference parameter value invalid	Set the value of the reference parameter to a value other than 0.0 (p0304, p0305, p0310, p0596, p2000, p2001, p2002, p2003, r2004).
F01034	Unit switchover: Calculation of the parameter values after reference value change unsuccessful	Select the value of the reference parameter so that the parameters involved can be calculated in the per unit notation (p0304, p0305, p0310, p0596, p2000, p2001, p2002, p2003, r2004).
F01122	Frequency at the probe input too high	Reduce the frequency of the pulses at the probe input.
A01590	Motor maintenance interval lapsed	Carry out the maintenance.
A01900	PROFIBUS: Configuration telegram faulty	Explanation: A PROFIBUS master is attempting to establish a connection with a faulty configuration telegram. Check the bus configuration on the master and slave side.
F01910	Fieldbus SS setpoint timeout	Check the bus connection and communication partner, e.g. switch the PROFIBUS master to the RUN status.
A01920	PROFIBUS: Cyclic connection interrupt	Explanation: The cyclic connection to PROFIBUS master is interrupted. Establish the PROFIBUS connection and activate the PROFIBUS master with cyclic operation.
F03505	Analog input, wire break	Check the connection to the signal source for interrupts. Check the level of the signal supplied. The input current measured by the analog input can be read out in r0752.
A03520	Temperature sensor fault	Check that the sensor is connected correctly.
A05000 A05001 A05002 A05004 A05006	Power Module overtemperature	Check the following: - Is the ambient temperature within the defined limit values? - Are the load conditions and duty cycle configured accordingly? - Has the cooling failed?

Number	Cause	Remedy
F06310	Supply voltage (p0210) incorrectly parameterized	Check the parameterized supply voltage and if required change (p0210). Check the line voltage.
F07011	Motor overtemperature	Reduce the motor load. Check ambient temperature. Check sensor's wiring and connection.
A07012	I2t Motor Module overtemperature	Check and if necessary reduce the motor load. Check the motor's ambient temperature. Check thermal time constant p0611. Check overtemperature fault threshold p0605.
A07015	Motor temperature sensor alarm	Check that the sensor is connected correctly. Check the parameter assignment (p0601).
F07016	Motor temperature sensor fault	Make sure that the sensor is connected correctly. Check the parameterization (p0601).
F07086 F07088	Unit switchover: Parameter limit violation	Check the adapted parameter values and if required correct.
F07320	Automatic restart aborted	Increase the number of restart attempts (p1211). The current number of start attempts is shown in r1214. Increase the wait time in p1212 and/or monitoring time in p1213. Create ON command (p0840). Increase the monitoring time of the power unit or switch off (p0857). Reduce the wait time for resetting the fault counter p1213[1] so that fewer faults are registered in the time interval.
A07321	Automatic restart active	Explanation: The automatic restart (AR) is active. During voltage recovery and/or when remedying the causes of pending faults, the drive is automatically switched back on.
F07330	Search current measured too low	Increase search current (P1202), check motor connection.
A07400	V_{DC_max} controller active	If the controller is not to intervene: • Increase the ramp-down times. • Deactivate the V_{DC_max} controller (p1240 = 0 for vector control, p1280 = 0 for V/f control).
A07409	V/f control current limiting controller active	The alarm automatically disappears after one of the following measures: • Increase the current limit (p0640). • Reduce load. • Increase the ramp-up time to the speed setpoint.
F07426	Technology controller actual value limited	• Adapt the limits to the signal level (p2267, p2268). • Check the actual value scaling (p2264).

Number	Cause	Remedy
F07801	Motor overcurrent	Check current limits (p0640). U/f control: Check the current limiting controller (p1340 … p1346). Increase acceleration ramp (p1120) or reduce load. Check motor and motor cables for short circuit and ground fault. Check motor for star-delta connection and rating plate parameterization. Check power unit / motor combination. Select flying restart function (p1200) if switched to rotating motor.
A07805	Drive: Power unit overload I2t	• Reduce the continuous load. • Adapt the load cycle. • Check the assignment of rated currents of the motor and power unit.
A07850	External alarm 1	The signal for "external alarm 1" has been triggered. Parameter p2112 defines the signal source of the external alarm. Remedy: Rectify the cause of this alarm.
F07901	Motor overspeed	Activate precontrol of the speed limiting controller (p1401 bit 7 = 1).
F07902	Motor stalled	Check whether the motor data has been parameterized correctly and perform motor identification. Check the current limits (p0640, r0067, r0289). If the current limits are too low, the drive cannot be magnetized. Check whether motor cables are disconnected during operation.
A07910	Motor overtemperature	Check the motor load. Check the motor's ambient temperature. Check the KTY84 sensor.
A07920	Torque/speed too low	The torque deviates from the torque/speed envelope curve. • Check the connection between the motor and the load. • Adapt the parameterization corresponding to the load.
A07921	Torque/speed too high	
A07922	Torque/speed out of tolerance	
F07923	Torque/speed too low	• Check the connection between the motor and the load. • Adapt the parameterization corresponding to the load.
F07924	Torque/speed too high	
A07927	DC braking active	Not required
A07980	Rotary measurement activated	Not required
A07981	No enabling for rotary measurement	Acknowledge pending faults. Establish missing enables (see r00002, r0046).
A07991	Motor data identification activated	Switch on the motor and identify the motor data.
F08500	Monitoring time, configuration expired	The monitoring time for the configuration has expired. • Check the PROFINET connection.
F08501	Setpoint timeout	• Check the bus connection. • Set the controller to RUN mode. • If the error occurs repeatedly, check the monitoring time set (p2044).
F08502	Monitoring time, sign-of-life expired	• Check the PROFINET connection.
F08510	Send configuration data not valid	• Check the PROFINET configuration

Number	Cause	Remedy
A08511	Receive configuration data not valid	
A08526	No cyclic connection	• Activate the controller with cyclic operation. • Check the parameters "Name of Station" and "IP of Station" (r61000, r61001).
A08565	Consistency error affecting adjustable parameters	Check the following: • IP address, subnet mask or default gateway is not correct. • IP address or station name used twice in the network. • Station name contains invalid characters.
F08700	Communications error	A CAN communications error has occurred. Check the following: • Bus cable • Baud rate (p8622) • Bit timing (p8623) • Master Start the CAN controller manually with p8608 = 1 after the cause of the fault has been resolved!
F13100	Know-how protection: Copy protection error	The know-how protection and the copy protection for the memory card are active. An error occurred during checking of the memory card. • Insert a suitable memory card and switch the inverter supply voltage temporarily off and then on again (POWER ON). • Deactivate the copy protection (p7765).
F13101	Know-how protection: Copy protection cannot be activated	Insert a valid memory card.
F30001	Overcurrent	Check the following: • Motor data, if required, carry out commissioning • Motor's connection method (Y / Δ) • U/f operation: Assignment of rated currents of motor and Power Module • Line quality • Make sure that the line commutating reactor is connected properly • Power cable connections • Power cables for short-circuit or ground fault • Power cable length • Line phases If this doesn't help: • U/f operation: Increase the acceleration ramp • Reduce the load • Replace the power unit
F30002	DC-link voltage overvoltage	Increase the ramp-down time (p1121). Set the rounding times (p1130, p1136). Activate the DC link voltage controller (p1240, p1280). Check the line voltage (p0210). Check the line phases.

Number	Cause	Remedy
F30003	DC-link voltage undervoltage	Check the line voltage (p0210).
F30004	Inverter overtemperature	Check whether the inverter fan is running. Check whether the ambient temperature is in the permissible range. Check whether the motor is overloaded. Reduce the pulse frequency.
F30005	I2t inverter overload	Check the rated currents of the motor and Power Module. Reduce current limit p0640. When operating with U/f characteristic: Reduce p1341.
F30011	Line phase failure	Check the inverter's input fuses. Check the motor cables.
F30015	Motor cable phase failure	Check the motor cables. Increase the ramp-up or ramp-down time (p1120).
F30021	Ground fault	• Check the power cable connections. • Check the motor. • Check the current transformer. • Check the cables and contacts of the brake connection (a wire might be broken).
F30027	Time monitoring for DC link pre-charging	Check the supply voltage on the input terminals. Check the line voltage setting (p0210).
F30035	Overtemperature, intake air	• Check whether the fan is running. • Check the fan filter elements. • Check whether the ambient temperature is in the permissible range.
F30036	Overtemperature, inside area	
F30037	Rectifier overtemperature	See F30035 and, in addition: • Check the motor load. • Check the line phases
A30049	Internal fan defective	Check the internal fan and if required replace.
F30059	Internal fan defective	Check the internal fan and if required replace.
A30502	DC link overvoltage	• Check the device supply voltage (p0210). • Check the line reactor dimensioning
A30920	Temperature sensor fault	Check that the sensor is connected correctly.